

A REVIEW OF THE CYPRINOID FISHES OF JAPAN.

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In the present paper is given an account of the Cyprinidae, or carp-like fishes, known to inhabit the rivers and lakes of Japan. In Japan, as in most other regions outside of Polynesia, Australia, and South America, the Cyprinidae far outnumber all other fresh-water fishes, and probably numerous species yet remain undescribed, especially in the rivers of Kiusiu. This paper is based on material belonging to the United States National Museum and to the museum of Leland Stanford Junior University. Most of it was collected in 1900 by Professors Jordan and Snyder. The illustrative plates are drawn by Mrs. Chloe Lesley Starks and Mr. Charles Bradley Hudson.

Family CYPRINIDÆ.

CARPS.

Margin of the upper jaw formed by the premaxillaries alone; lower pharyngeal bones well developed, falciform, nearly parallel with the gill arches, each provided with 1 to 3 series of teeth in small number, 4 to 7 in the main row, and a less number in the others, if more are present. Head naked; body usually scaly. Barbels 2 or 4, often absent. Belly usually rounded, rarely compressed, never serrated. Gill openings moderate, the membranes broadly joined to the isthmus. Branchiostegals always 3. Gills 4, a slit behind the fourth. Pseudo-branchiæ usually present. No adipose fin. Dorsal fin short or elongate. Ventral fins abdominal. Air bladder usually large, commonly divided into an anterior and a posterior lobe, not inclosed in a bony capsule, rarely wanting. Stomach without appendages, appearing as a simple enlargement of the intestines. Fishes mostly of moderate or small size, inhabiting the fresh waters of the Old World and of North America, excessively abundant where found, both in individuals and species. The spring, or breeding dress, of the males is often peculiar. The top of the head, and often the fins or various portions of the body, are covered with small tubercles, outgrowths from the epidermis.

The fins and lower parts of the body in the spring males are often charged with bright pigment, the prevailing color of which is red, although in some genera it is satin-white, yellowish, or black.

- a* Dorsal fin short, of 8 to 15 rays, usually without serrated spine; no anal spine; air bladder normally placed.
- b* RHODEIX.E. Intestinal canal elongate, usually more than twice length of body; teeth one-rowed, with grinding surface; lips thin; body compressed; peritoneum black; species herbivorous.
- c* Barbels none; body deep, compressed; scales rather small, closely imbricated, about 55 in lateral line; teeth 5-5, with serrate edges; anal fin rather long *Pseudoperidampus*, 1.
- cc* Barbels present, at the end of each maxillary; scales large, 36 to 40.
- d* Body rather deep, rhomboid, compressed.
- e* Teeth serrate; dorsal long, of about 15 rays *Paracheilognathus*, 2.
- ee* Teeth with entire edges; dorsal moderate, of about 12 rays.
Acheilognathus, 3.
- ddl* Body rather elongate, lanceolate in outline; dorsal short, of about 10 rays; teeth entire *Gnathopogon*, 4.
- bb* Intestinal canal short, less than twice length of body; teeth one, two, or three rowed; peritoneum usually pale. Species more or less carnivorous.
- f* Teeth hooked, slender, none of them molar, the grinding surface, if present, very narrow.
- g* Barbels present, well developed, one of them terminal on the maxillary.
- h* BARBIN.E. Dorsal fin with its first developed ray thickened or spine-like.
- i* Barbels two on each side; teeth three-rowed; lips thick; head with mucous cavities *Hemibarbus*, 5.
- hh* GOMIONIX.E. Dorsal fin without spine-like ray; scales large.
- j* Teeth 1, 2 or 3, 5-6 or 5, 3, 2 or 1, two-rowed.
- k* Lips thin; mouth, terminal, oblique; dorsal nearly over ventrals *Leucogobio*, 6.
- kk* Lips broad and papillose; mouth small, protracted downward *Pseudogobio*, 7.
- jj* Teeth one-rowed, 5-5.
- l* Mouth inferior; lips rather thick, ventrals behind front of dorsal.
- m* Dorsal fin low, its median rays not produced; head rounded above *Sarcocheilichthys*, 8.
- mm* Dorsal fin high, its median rays produced in males; head flattened above *Abbottina*, 9.
- ll* Mouth terminal, oblique, the lower jaw projecting; head depressed and pointed *Zezera*, 10.
- gg* LEUCISCIX.E. Barbels wanting.
- n* Teeth one-rowed, 5-5; a notch on shoulder girdle below, inside gill opening; scales large.
- o* Snout very blunt, rounded; mouth inferior. *Bivia*, 11.
- oo* Snout long; mouth small, terminal, nearly vertical *Pseudorasbora*, 12.
- nn* Teeth two-rowed; 2, 5-4, 5, or 6, 2 or 1.
- p* Lateral line straight; teeth 2, 5-5, 2; mouth terminal, very oblique; scales large, about 40.
Otakia, 13.
- pp* Lateral line curved downward.

- q* Dorsal fin inserted in advance of ventrals; scales small, about 75; dorsal fin short; teeth 2, 5—6, 2 *Tribolodon*, 14.
- qq* Dorsal inserted behind ventrals; teeth 2, 4 or 5—5, 2 or 1.
- r* Lateral line complete *Luciscus*, 15
- rr* Lateral line incomplete; teeth 2, 5—4 or 5, 2 *Phoxinus*, 16
- mm* Teeth three-rowed.
- s* Abdomen behind ventrals, its edge rounded, as usual; anal in male elevated.
- t* Upper jaw normal, without deep notch; teeth 1 or 2, 4, 4 or 5—5, 4, 2 or 1. Scales 40 to 60 *Zacco*, 17
- tt* Upper jaw produced, with a deep notch; teeth 2, 4, 5—5, 4, 2. Scales about 50 *Opsariichthys*, 18
- ss* Abdomen behind ventrals, compressed to an edge; before ventrals rounded; anal elongate of 15 rays; first dorsal ray more or less enlarged and spine-like; teeth 2, 4, 5—5, 4, 2; scales small, about 70 *Ischikavia*, 19

aa CYPRININÆ. Dorsal fin many-rayed, preceded by a strong, serrated spine; anal spine present; teeth molar.

- u* Barbels none; teeth 4—4, one-rowed *Carassius*, 20
- uu* Barbels two on each side; teeth three-rowed, 1, 1, 3—3, 1, 1 *Cyprinus*, 21

1. PSEUDOPERILAMPUS Bleeker.

Pseudoperilampus BLEEKER, Versl. Med. Ak. Vet. Amst., XV, 1863, p. 235, (*typus*).

Body short, deep, and rhomboid. Head small, and the upper profile concave over the eyes; eye large; snout bluntly pointed; mouth small, oblique; no barbels; teeth 5—5, the sides serrate; interorbital space broad. Intestine long. Peritoneum black. Scales small, and very narrowly imbricated, about 55 in lateral line. Origin of dorsal nearer base of caudal than tip of snout, its base rather long, with 10 developed rays; anal with 10 developed rays; caudal emarginate; ventrals inserted before dorsal. Lateral line nearly straight and continuous.

Herbivorous fishes of the Japanese streams and lakes, resembling the bream (*Abramis*).

(*ψευδης*, false; *perilampus*, a related genus.)

1. PSEUDOPERILAMPUS TYPUS Bleeker.

ZENITANAGO (COIN-MINNOW); NIGABUNA (BITTER CARP).

Pseudoperilampus typus BLEEKER, Versl. Ak. Vet. Amst., XV, p. 235; Tokyo: Ned. Tyds. Dierk., I, p. 382.—GÜNTHER, Cat. Fish., VII, 1868, p. 281; from Japan, same type.

Pseudoperilampus sp. ISHIIHAWA, Prel. Cat., 1897, p. 12; Tokyo, Tegauma.

Head, $3\frac{3}{4}$; depth, $2\frac{1}{2}$; D. III, 10; A. III, 10; P. 12; V. 8; scales, 55 in the lateral line; 12 scales between origin of dorsal and lateral line.

and 10 between the latter and middle of belly; pharyngeal teeth 5—5; width of head, $1\frac{2}{3}$ in its length; snout, $4\frac{2}{5}$ in head; eye, $3\frac{1}{2}$; interorbital space, $2\frac{1}{2}$; pectoral, $1\frac{2}{5}$; ventral, $1\frac{2}{3}$.

Body rather short, deep, rhomboid, and compressed. Head small, compressed and bluntly pointed; upper profile of head concave over the eyes; snout less than eye, rounded above and bluntly pointed; eye rather large, anterior; mouth small, oblique, the maxillary protractile and reaching below the nostrils, but not to the anterior edge of eye; lips rather thin; pharyngeal teeth compressed, with a narrow grinding surface; the sides serrate, and the tips slightly hooked; nostrils close together on the snout in front of eye; interorbital space and top of head broad and slightly convex. Gill openings rather large; gill-rakers small and weak; pseudobranchial present. Intestine long, with many convolutions. Peritoneum black.

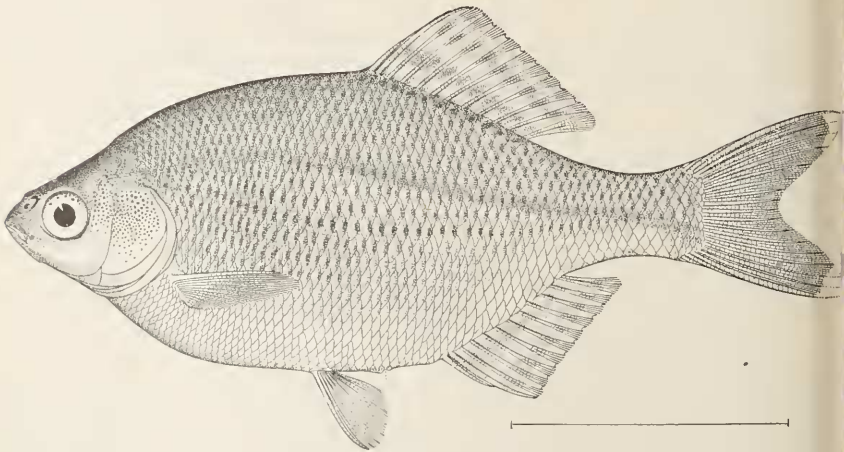


FIG. 1.—*PSEUDOPERILAMPUS TYPUS*.

Scales rather small, and all more or less very narrowly imbricated, so that they are much deeper than long; no pectoral flap; ventral flap present.

Origin of dorsal nearer base of caudal than tip of snout, the anterior rays the highest, the base of the fin about equal to the head, and the third rudimentary ray stronger than the others; anal beginning about midway between origin of pectoral and base of caudal, or a little before the middle of base of dorsal, and its base a trifle more than head without snout; caudal emarginate, the lobes pointed; pectoral reaches to within a short distance of ventral; origin of ventral well before that of the dorsal, or nearer tip of snout than base of caudal, and reaching within a short distance of origin of anal. Caudal peduncle compressed, and its least depth a little over 2 in head. Lateral line slightly decurved and continuous.

Color in alcohol, dark brown above, pale or silvery below, and each of the scales above and on the sides with a narrow brown margin, forming a reticulated appearance; top of head and snout dark brown; dorsal and anal grayish, with 2 longitudinal pale or whitish bands; caudal and pectoral grayish; ventrals pale; sides with a pale lateral streak, becoming more distinct and darker along the sides of caudal peduncle; a dark blotch above and behind gill-opening.

Length $2\frac{1}{2}$ inches.

This description from a specimen from Tsuruga.

This species is represented in our collection by many examples from Tsuruga in Echizen, Tsuchiura near Tokyo, Matsushima in Rikuzen, and the Tokyo market. It is generally common in the streams of northern Japan. From the species of *Acheilognathus* it is readily distinguished by its small scales.

(*τυπός*, type.)

2. PARACHEILOGNATHUS Bleeker.

Paracheilognathus BLEEKER, Atlas Ichth., III, 1863, p. 33 (*rhombus*).

Body short, deep and rhomboid. Head small; eye moderate; snout pointed and slightly projecting; mouth small, inferior, the maxillary not reaching eye; a small maxillary barbel, generally less than half the eye; teeth 5—5, the edges serrate; interorbital space broad. Intestine long. Peritoneum dark or blackish. Scales large, some of those on the sides strongly imbricated, 37. Origin of dorsal midway between tip of snout and base of caudal, base of fin long, with 14 developed rays; anal with 10 developed rays; caudal deeply emarginate; ventrals inserted a little before origin of dorsal. Lateral line slightly deurved, and continuous. Short, deep-bodied fishes of the rivers of Japan.

(*ηαρά*, near; *acheilognathus*.)

2. PARACHEILOGNATHUS RHOMBEA (Schlegel).

TABIRA (SHINER); AKABABIRA (RED-SHINER); BOTE TANAGO^a (POTBELLY).

Capocta rhombea SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 205, pl. c, fig. 6; streams near Nagasaki.

Acheilognathus rhombus BLEEKER, Prodr. Cypr., 1860, p. 255.

Paracheilognathus rhombus BLEEKER, Atl. Ichthyol. Cypr., 1863, p. 33.

Achilognathus rhombus GÜNTHER, Cat. Fish, VII, 1868, p. 279; Nagasaki, from one of Schlegel's types.—ISHIKAWA, Prel. Cat., 1897, p. 12; Tokyo, Lake Biwa, Yamashiro.

Achilognathus steenackeri SAUVAGE,^b Bull. Soc. Philom. Paris, 1883, p. 3; Lake Biwa.

^aThe name *Tanago* is used alike for the deep-bodied shiners and for the surf-fish, *Ditrema temminckii*.

^bThe following is the description given by Dr. Sauvage:

"D. 14-15; A. 11-12; L. lat. 38. Hauteur du corps contenue près de trois fois et demie dans la longueur totale; longueur de la tête cinq fois et un tiers dans la même

Head, $4\frac{1}{2}$; depth, $2\frac{1}{2}$; D., II, 14; A., III, 10; P., 14; V., 8; scales, 37 in lateral line; 6 scales between origin of dorsal and lateral line, and 7 scales between latter and middle of belly; pharyngeal teeth, 5—5; width of head, $1\frac{3}{8}$ in its length; snout, 4 in head; eye, 4; interorbital space, $2\frac{1}{2}$; pectoral, $1\frac{1}{3}$; ventral, $1\frac{1}{4}$.

Body deep, rhomboid, and greatly compressed. Head short and compressed; snout pointed, convex above, and slightly projecting beyond the jaws; eye moderate, anterior about equal to snout; mouth small, inferior, and protractile, the maxillary not reaching as far posteriorly as the front margin of eye; lips somewhat fleshy; a small maxillary barbel generally less than half the eye; pharyngeal teeth serrated, and hooked over at tips; nostrils together, nearer eye than tip of snout; interorbital space broad, elevated a little, and flattened in the middle. Gill openings large; gill rakers short, weak, and rather few in number; pseudobranchiæ well developed. Intestine very long, and with numerous convolutions. Peritoneum dark or blackish.

Scales large, cycloid, and some on the middle of the sides strongly imbricated; no pectoral flap; ventral flap rather short.

Origin of dorsal about midway in the length of the body without caudal, the anterior rays the highest, the base of the fin a little over 3 in body without caudal, the third rudimentary ray as long as first developed ray, thick and strong, and the margin of the fin convex; origin of anal about midway in the base of dorsal, or the space between the origin of ventral and base of last anal ray, the anterior rays the highest, the base of the fin equal to head without snout, and the margin of the fin nearly straight; caudal deeply emarginate, the lobes pointed; pectorals rather small, low, and reaching two-thirds the distance to origin of ventrals; ventrals inserted a little before the origin of dorsal and reaching almost to origin of anal. Caudal peduncle moderately long, and its least depth 2 in head. Lateral line continuous and nearly straight along the sides to base of caudal.

Color in alcohol, dark brown above, the scale edged with darker; below pale, washed with silvery; sides more or less brassy; a dark, blackish streak, narrow at first and becoming wider posteriorly along the sides, continued along the caudal peduncle, but not to the base of

dimension. Museau aussi long que l'œil, dont le diamètre est compris trois fois et demie dans la longueur de la tête; espace interorbitaire plus large que le diamètre de l'œil; barbillons très courts; dents pharyngiennes non dentelées; de gros pores autour de la partie supérieure de l'œil et sur le museau chez les mâles, nuls chez les femelles. Dorsale insérée à égale distance du museau et de la base de la caudale chez les femelles, un peu plus près de la base de la caudale chez les mâles; pectorales s'étendant à l'origine des ventrales chez les femelles, un peu plus courtes chez les mâles. Corps de couleur argenté; chez les femelles une bande cérulescente sur le pédicule caudal; chez les mâles des lignes cérulescentes longitudinales dans la partie postérieure du corps. Un long tube externe urogénita, chez les femelles. Longueur, 0, 100. Nom vulgaire, *Funa*; *Akababira*.

the caudal; a dark spot above the gill opening; dorsal and caudal dark or blackish with indistinct narrow bands, the other fins paler, but all of them more or less tinted with brownish.

Color in life, steel blue; sides bright crimson, with silver luster; two blue bars at shoulder; belly and lower fins crimson, with dark shades.

Length, 4 inches.

This description from a specimen from Lake Biwa at Matsubara. Of this species we have very many specimens from Matsubara on Lake Biwa, from the Yodo River at Osaka, from the Chikugo River at Kurume, from the springs of Fumayado in Kiusiu, Lake Yogo near Wakanogo, above Lake Biwa, and several examples from the collection of K. Otaki, from near Karasaki on Lake Biwa. It is the largest of the minnows of its tribe, and is almost everywhere common south of Tokyo, in the larger streams and ponds. In life it is brightly colored, the fins largely red.

(*ρόμβος*, diamond.)

3. ACHEILOGNATHUS Bleeker.

Acheilognathus BLEEKER, Ichth. Archipel. Indic. Prodr., 11, 1860, p. 228 (*melanogaster*).

Body more or less deep and compressed; head short; eye more or less large; snout rather short and blunt; mouth small, the maxillary not reaching the eye; maxillaries each with a barbel; teeth 5—5, smooth, with a narrow grinding surface; interorbital space rather broad. Intestine long. Peritoneum black. Scales large, some of those on the sides imbricated, 36 to 39. Origin of dorsal about midway in the length of body without caudal, base of fin moderate, with 8 to 10 developed rays; anal with 8 to 10 developed rays; caudal deeply emarginate; ventrals generally inserted a little before origin of dorsal. Lateral line slightly decurved, and continuous.

Small fishes of the streams and lakes of Japan, Formosa, and China, differing from *Paracheilognathus* in the shorter dorsal and smooth edged teeth.

(*α*. without; *χελῖλος*, lip; *γνάθος*, jaw.)

- a* Shoulder with a more or less distinct, dark shoulder spot above gill-opening; sides with a more or less distinct longitudinal band posteriorly; belly black in adults, the color of the peritoneum showing through.
- b* Barbels short, seldom more than half the eye; shoulder spot and lateral band very distinct *limbata*, 3.
- bb* Barbels long, somewhat less than the eye; shoulder spot and lateral band very indistinct or absent *lineolata*, 4.
- aa* Shoulder without dark spot above gill opening; a longitudinal dark band beginning abruptly in a dark blue spot over pectoral on the sixth scale from head and continued to base of caudal *cyanostigma*, 5.

3. ACHEILOGNATHUS LIMBATA (Schlegel).

ZAKO; TANAGG.

Copœta limbata SCHLEGEL, Fauna Japonica, Poiss, 1846, p. 203, pl. c, fig. 5; Streams near Nagasaki.

Achilognathus limbatus GÜNTHER, Cat. Fish., VII, 1868, p. 277; Nagasaki, from one of Schlegel's types.

Achilognathus intermedium JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 344; Lake Biwa (not of Schlegel).

Head 4; depth 3; D. III, 10; A. III, 10; P. 15; V. 8; scales 36 in lateral line; 6 scales between origin of dorsal and lateral line, and 6 scales between the latter and middle of belly; pharyngeal teeth 5—5; width of head $1\frac{3}{4}$ in its length; snout 4 in head; eye 3; interorbital space $2\frac{3}{4}$; pectoral $1\frac{1}{6}$; ventral $1\frac{1}{2}$.

Body rather elongate, moderately deep, and compressed. Head short, and compressed; snout short, rather blunt and not produced; eye rather large, anterior; mouth small, oblique, and reaching below the nostril; maxillary protractile, and furnished with a small barbel which is seldom more than half the eye in length; pharyngeal teeth with a narrow grinding surface, smooth, and without serrations; nostrils close together, and near the upper part of the eye; interorbital space rather broad, slightly elevated and flattened medianly. Gill-openings rather large; gill rakers short, weak, and few in number; pseudobranchial present. Intestine with numerous convolutions. Peritoneum black.

Scales large, cycloid, and narrowly imbricated in the costal region; no pectoral flap; a short, scaly, ventral flap.

Origin of dorsal about midway, or a trifle in advance, in the length of the body without caudal, the anterior rays the highest, the base of the fin about $4\frac{1}{3}$ in body without caudal, the third rudimentary ray as long as first developed ray and rather strong, and the margin of the fin straight; origin of anal below the middle, or a trifle posterior, base of dorsal much nearer the origin of ventral than base of last anal ray, similar to dorsal in shape, with the anterior rays the highest, the base of the fin less than head without snout, and the margin of the fin nearly straight; caudal very deeply emarginate, the lobes well developed and pointed; pectorals equal the head from anterior nostril to edge of opercle, and reach to within a short distance of the origin of the ventrals; ventrals slightly in front of the origin of the dorsal, and reaching beyond the origin of the anal. Caudal peduncle rather long, its least depth $2\frac{1}{4}$ in head. Lateral lines nearly straight, and continuous along the sides to the base of caudal.

Color in alcohol, dark brown above, tinged with olivaceous, and below paler, except the abdomen, which is black; a narrow blackish streak beginning on the sides in front above the lateral line, and is continued to within a short distance of the base of the caudal, becom-

ing much wider upon the sides of the caudal peduncle; a dark spot above gill-opening; dorsal grayish, with 3 darker longitudinal bands; caudal grayish, with several darker cross bands; pectorals grayish; ventrals and anal black, with white edges; lower surface of the head pale or whitish.

Length, 3 inches.

This description from a specimen from Lake Yogo in Mino, above Lake Biwa.

Fresh waters of central and southern Japan, very abundant. We have a very numerous series from Lake Biwa at Matsubara and Kurasaki, from the river at Tsuchiura, the Iwai River at Ichinoseki, from near Nagoya, and the Kitakami River at Morioka.

It is the only species of the group common in northern Japan. It is known by its more elongate form, as contrasted with *Paraheilognathus rhombica*, though with a similar color pattern, with the addition of a black abdomen, and dark pectorals, and ventrals, in some adults.

The dorsal radii are fewer than those of *P. rhombica* and the pharyngeal teeth are smooth.

(*limbatus*, bordered.)

4. ACHEILOGNATHUS LANCEOLATA (Schlegel).

ZAKO.

Capoëta lanceolata SCHLEGEL, Fauna Japonica, 1846, p. 202, pl. c, fig. 3; streams about Nagasaki.

Acheilognathus lanceolatum JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 344; Lake Biwa.

Acheilognathus melanogaster BLEEKER, Act. Soc. Sci. Indo. Nedrl. Japan, VI, p. 92, pl. II, fig. 1; Tokyo.—SAUVAGE, Bull. Soc. Philom., 1883, p. 3; Lake Biwa.—GÜNTHER, Cat. Fish, VII, 1868, p. 278; Tokyo, from one of Bleeker's types.—ISHIKAWA, Prel. Cat., 1897, p. 12; Lake Biwa, Owari.—GÜNTHER, Shore Fishes, Challenger, 1880, p. 72; Lake Biwa.

Capoëta intermedia SCHLEGEL, Fauna Japonica, p. 203, pl. c, fig. 4; streams about Nagasaki.

Acheilognathus intermedius GÜNTHER, Cat. Fish, VII, 1868, p. 278, copied.—SAUVAGE, Bull. Sci. Philom., 1883, p. 3; Lake Biwa.—ISHIKAWA, Prel. Cat., 1897, p. 12; Tokyo; Yodo R. at Kyoto; Maebara and Matsubara on Lake Biwa.

Head $4\frac{1}{4}$; depth 3; D. III, 9; A. III, 9; P. 15; V. 8; scales 38 in the lateral line; 6 scales between the origin of the dorsal and the lateral line; and 6 scales between the latter and middle of belly; pharyngeal teeth 5—5; width of head $1\frac{3}{4}$ in its length; snout $4\frac{1}{4}$ in head; eye $3\frac{1}{4}$; interorbital space $2\frac{2}{3}$; pectoral about $1\frac{2}{3}$; ventral $1\frac{1}{2}$.

Body rather elongate, moderately deep and compressed. Head short, compressed; snout short and bluntly rounded; eye moderately large, anterior; mouth small, oblique, the maxillary reaching to the nostril, and protractile; maxillary barbel long, but little shorter than the eye; pharyngeal teeth smooth, and with a narrow grinding surface; nostrils close together in front of the eye above; interorbital

space broad, slightly elevated, and flattened in the middle. Gill-openings rather large; gill-rakers short, weak and few in number; pseudo-branchiae well developed. Intestine with numerous convolutions. Peritoneum black.

Scales large, cycloid, and some narrowly imbricated on the sides; no pectoral flap; ventral flap small.

Origin of dorsal about midway, or a trifle in advance, in the length of the body, without caudal, the anterior rays the highest, the base of the fin $4\frac{1}{2}$ in body without caudal, the third rudimentary ray more or less stiff and strong, and the margin of the fin nearly straight; origin of anal below the posterior dorsal rays, and about midway between the origin of ventrals and base of last anal ray, similar in shape to the dorsal, the anterior rays the highest, the base of fin less than head without snout, the third rudimentary ray stiff, and the margin of the fin nearly straight; caudal deeply emarginate, the lobes pointed; pectorals reach a little over two-thirds the distance to origin of ventrals; ventrals inserted a little before origin of dorsal and reaching to within a short distance of origin of anal. Caudal peduncle rather long and its least depth about $2\frac{1}{4}$ in head. Lateral line slightly decurved, and continued to base of caudal.

Color in alcohol, dark brown above, pale below, except the abdomen and ventrals, which are blackish; a very pale and indistinct brown spot above gill-opening, and a pale, indistinct brown or grayish stripe along the sides above the lateral line, and posteriorly; dorsal and anal grayish, with several longitudinal dark bands across the former, and the latter broadly edged with whitish; caudal and pectorals grayish.

Length, $3\frac{5}{16}$ inches.

Here described from an example from Tsuchiura.

The species is very abundant in central and southern Japan. Our many examples from Tsuchiura, the Chikugo River at Kurume, the Yodo River at Osaka, Lake Biwa at Matsubara, Katata in Omi, Lake Yogo in Mino, Funayado in Kiusin, Wakanoura, in Owari near Nagoya.

This species is distinguished chiefly by its long barbel and plain coloration. The young are marked with a more or less distinct lateral stripe, but are without a dark spot above the gill opening.

(*lanceolata*, lanceolate.)

5. ACHEILOGNATHUS CYANOSTIGMA Jordan and Fowler, new species.

Head, 4; depth, $3\frac{1}{16}$; D. III, 8; A. III, 8; P. 16; V. 8; scales, 39 in lateral line; 6 scales between origin of dorsal and lateral line, and 6 scales between the latter and middle of belly; pharyngeal teeth 5—5; width of head, 2 in its length; snout, $3\frac{2}{3}$ in head; eye, 4; interorbital space, $2\frac{2}{3}$; pectoral, $1\frac{1}{2}$; ventral, $1\frac{2}{3}$.

Body moderately deep, and compressed. Head rather small, compressed; snout rather bluntly pointed and a trifle produced; eye small,

anterior; mouth small, inferior; maxillary short, reaching to the nostril and protractile; maxillary barbel very short; pharyngeal teeth smooth, and with a narrow grinding surface; nostrils close together and near the upper part of the eye; interorbital space rather broad, slightly elevated and flattened medianly. Gill-openings rather large; gill-rakers short, few, and weak; pseudobranchiae present.

Intestine with numerous convolutions. Peritoneum black.

Scales moderately large, cycloid, and some of them imbricated on the sides; no pectoral flap; ventral flap small.

Origin of dorsal about midway in the body without caudal, the anterior rays the highest, the base of the fin about 5 in body without caudal, and the upper edge of the fin nearly straight; origin of anal below the posterior dorsal rays or about midway between origin of ventral and base of last anal ray, the anterior rays the highest, the base of the fin about 5 in body without caudal, and the upper edge of the fin nearly

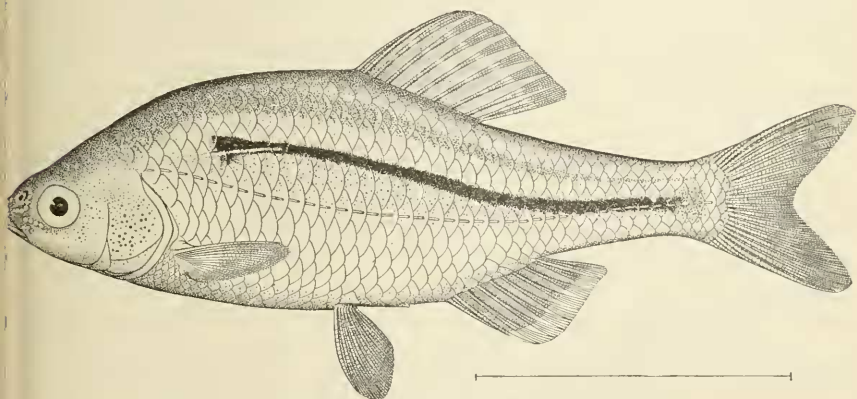


FIG. 2.—ACHEILGNATHUS CYANOSTIGMA.

straight; origin of anal below the posterior dorsal rays or about midway between origin of ventral and base of last anal ray, the anterior rays the highest, the base of the fin $1\frac{3}{4}$ in head, and the margin of the fin nearly straight; caudal deeply emarginate and the lobes pointed; pectorals reaching about two-thirds of the distance to origin of ventrals; ventrals inserted below the origin of the dorsal, and reaching the origin of the anal. Caudal peduncle rather long, a trifle shorter than head, and its least depth about $2\frac{1}{2}$ in head. Lateral line slightly decurved and continued to the base of caudal.

Color in alcohol, brownish above, pale beneath; dorsal and caudal grayish black, the former with several darker longitudinal cross bars; anal grayish, with a broad marginal, whitish band; pectorals grayish; ventrals grayish black; snout dark brown; sides with a longitudinal, blackish band beginning abruptly in a black spot on the upper part of the sides about over the middle of the pectoral, and on the sixth scale from the head; no dark spot above gill opening.

Length, $2\frac{3}{4}$ inches.

Type No., 7724, Ichthyological Collections, Leland Stanford Junior University Museum. Cotypes are in the United States National Museum. Locality, Lake Biwa at Matsubara in Omi.

We have many specimens of this species from Lake Biwa at Matsubara and its tributary, Lake Yogo in Mino. It is distinguished chiefly by the dark, distinct, and nearly uniform lateral stripe beginning on the sixth scale from the head in a dusky bluish spot. In young specimens, the character is readily seen, and they are easily separated from the young of other species.

(κυανρός, blue; στίγμα, spot.)

4. GNATHOPOGON Bleeker.

Gnathopogon BLEEKER, Ichth. Archipel. Indic. Prodr., II. 1860, p. 434 (*elongata*).

Body elongate and compressed. Snout depressed and without bony prominence in front; eyes superior, not covered with eyelids; jaws with thin and simple lips; maxillary oblique, ending before the eye; two maxillary barbels. Abdomen not keeled. Dorsal with few rays before ventrals and ending in front of anal; anal with few rays. Lateral line slightly deurved. (Bleeker.)

No species of *Gnathopogon* was obtained by Jordan and Snyder. The genus is a doubtful one, perhaps not distinct from *Acheilognathus*. An East Indian species, *javanicus*, is referred by Dr. Bleeker to *Gnathopogon*.

(γνάθος jaw; ποτών, beard.)

a Scales 5—38—7; pectorals not reaching root of ventrals *elongatus*, 6.
aa Scales 4—35—5; pectorals reaching ventrals *gracilis*, 7.

6. GNATHOPOGON ELONGATUS (Schlegel).

MUGITSUKI.

Cyprina elongata SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 200, pl. c, fig. 1; streams about Nagasaki.

Gnathopogon elongatus JORDAN and SNYDER, Check List Fish. Japan, 1901, p. 47; Lake Biwa.

Barbus homogenus GÜNTHER, Cat. Fish., VII, 1868, p. 136 (after Schlegel, the name *elongatus* being preoccupied in *Barbus*).

Head 4 in length of body, between tip of snout and emargination of caudal, and somewhat more than depth of body; D. III, 7; A. II, 6; P. 15; V. I, 7; about 38 scales on the lateral line; 5 scales between the back and the lateral line; diameter of the eye equal to the length of snout, which is 4 in head. Mouth somewhat spacious, its cleft very oblique, and extending nearly to the tip of the snout; maxillary prolonged posteriorly for three-fourths the length of the snout; diameter of the suborbitals equal a third of the eye, but the length of the posterior nearly twice that of the others; length of maxillary barbel

scarcely exceeding half the diameter of the eye; nostrils only separated by a thin lobe which covers the posterior orifice, opening upon the lower sides of the snout midway between the intermaxillary and the eye; interorbital space considerably more than the diameter of the eye. The edge of the opercle forms a somewhat obtuse and rounded angle. Upper part of the head rounded upon the sides; its upper profile straight until the snout, which is somewhat convex. Line of demarcation between head and neck nearly straight; the skin of head and opercles smooth.

Scales with their surfaces marked with fine striae, very compact and somewhat divergent.

Insertion of dorsals slightly before the ventrals and nearer the head, the second and third rudimentary rays like the first and second of the anal, but the size of the fins a third larger than the latter; margin of anal straight, equals, or somewhat more than ventrals, and preceded by a weak spine less than half the length of the slender and flexible ray which follows, and which is also longer than the first divided ray of the fin; caudal emarginate, lobes pointed, and their length about half the fin; pectorals equal to head without snout and not reaching to base of ventrals by a space equal to half their own length; ventrals a fifth shorter than pectorals and almost reach the anus. Anus entirely after the origin of the anal and about two-thirds of the distance between tip of snout and base of caudal.

Color in spirits brown above with silvery reflections, below pale; opercles pure silvery white and the fins uniform yellowish; scales sprinkled with numerous minute black dots; a broad and ill-defined band of bluish-silvery extending along the sides of the body.

Two specimens, one 3 inches and the other $3\frac{1}{2}$ inches in length, taken in some stream near Nagasaki. (Schlegel.) The specimen taken by Otaki at Karasaki on Lake Biwa has been sent away.

(*elongatus*, elongate.)

7. GNATHOPOGON GRACILIS (Schlegel).

Capoëta gracilis SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 201, pl. c, fig. 2; streams near Nagasaki.

Barbus homozonus GÜNTHER, Cat. Fish., VII, 1868, p. 137, after Schlegel, the name *gracilis* preoccupied in *Barbus*.

Form elongate; depth $5\frac{1}{2}$ in the length of the body between tip of snout and emargination of caudal. Body posterior to dorsal slender. Head longer; eyes much larger; snout bulky and convex above; mouth cleft horizontal. Suborbitals narrower; barbels somewhat longer; pectorals very long and reaching nearly to the base of the ventrals; lateral line slightly deurved; anus remote from the anal fin; the scales much larger, only 25 in the lateral line; 4 rows of scales between lateral line and back and 5 rows between the former and the

abdomen. The form of the fins and the number of their rays, the color, and all the other characters, are common with *Gnathopogon elongatus*.

Length $2\frac{1}{2}$ inches. (Schlegel.)

From a stream near Nagasaki; perhaps identical with *Gnathopogon elongatus*.

(*gracilis*, slender.)

5. HEMIBARBUS Bleeker.

Hemibarbus BLEEKER, Prodr. Cyprin., 1861, p. 281 (*barbus*).

Body elongate, rather slender, and compressed. Head elongate, somewhat pointed, and with many mucous cavities about the eyes and along the edge of the preoperculum; snout long, blunt at the tip; eye rather large, high; mouth inferior, the maxillary not reaching eye; lips fleshy; each maxillary with a barbel as long as the eye; teeth 5, 3, 1—1, 3, 5. Gill-rakers short; intestine short. Peritoneum silvery; scales cycloid, about 49. Dorsal inserted nearer tip of snout than base of caudal, and armed with a slender, sharp, strong, and smooth spine; anal inserted far behind tip of depressed dorsal; caudal deeply emarginate, the lobes pointed; ventrals inserted behind origin of the dorsal. Lateral line slightly decurved and continuous.

Large fishes of the streams of Japan and Formosa, allied to the European Barbel (*Barbus barbus*).

(*jū*, half; *barbus*.)

8. HEMIBARBUS BARBUS (Schlegel).

SOI, NIGOI.

Gobio barbus TEMMINCK and SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 198, pl. xcix, fig. 1; near Nagasaki.

Hemibarbus barbus BLEEKER, Prodr. Cypr., 1861, p. 281.—JORDAN and SNYDER, Check List Fish. Japan, 1901, p. 46; Yokohama.—JORDAN and EVERMANN, Proc. U. S. Nat. Mus., 1902; Formosa.

Barbus schlegeli GÜNTHER, Cat. Fish., VII, 1868, p. 134; Formosa.—ISHIKAWA, Prel. Cat. 1897, p. 15; Tokyo, Ise.

Head $3\frac{1}{4}$; depth $4\frac{1}{2}$; D. III, 7; A. III, 6; P. 20; V. 9; scales 49 in the lateral line: 7 scales in an oblique series between origin of dorsal and lateral line, and 7 scales between the latter and middle of belly; pharyngeal teeth 5, 3, 1—1, 3, 5; width of head $2\frac{1}{4}$ in its length; snout $2\frac{3}{4}$ in head; eye 5; interorbital space $3\frac{3}{4}$; pectoral $1\frac{1}{2}$; ventral $1\frac{1}{2}$; eye 2 in snout.

Body elongate and compressed. Head elongate, pointed, greatly compressed, with many mucous cavities around the eyes, and below and behind the edge of the preoperculum; snout long, pointed, and produced; eyes moderately large, anterior and superior; mouth small, inferior, and with the upper jaw produced; lips fleshy and not broad; a slender maxillary barbel equal to the diameter of the eye; pharyn-

geal teeth in 3 rows, several with grinding surface, and compressed, and those in the inner row small; nostrils together, in front of the eye and about over the base of the maxillary barbel so that they are much nearer the eye than the tip of the snout; interorbital space broad and flattened like the rest of the top of the head. Gill-openings large; gill-rakers 7-12, some of the lower ones rudimentary; those which are well developed short and fleshy. Intestine short. Peritoneum silvery.

Scales large, of more or less uniform size, and cycloid; no scaly pectoral flap; ventral flap moderate.

Dorsal fin inserted nearer the tip of the snout than the base of the caudal, armed with a long, straight, smooth spine, the anterior dorsal rays the longest, so that when the fin is depressed the first reaches beyond the others; anal entirely behind dorsal and midway between the origin of the ventrals and the base of the caudal; caudal deeply forked, the lobes pointed; pectorals reach three-fourths the distance to the ventrals; origin of ventrals behind that of dorsal, about midway between tip of snout and base of caudal, and reaching a little more than half the space to anal; caudal peduncle compressed, its least depth a little over 3 in head. Lateral line continuous and slightly decurved in front.

Color in alcohol, brassy-brown above, the sides and lower surface silvery.

Length, $9\frac{3}{4}$ inches.

This description from an example from the Yodo River, in Osaka.

Fresh waters of Japan. Of this species we have examples from Lake Jinsaburogata at Nishitsugaru, Aomori (collection Sotaro Saito), the Yodo River at Osaka, the Chikugo River at Kurume, and from near Tokyo (*Albatross* collection).

(*barbus*, the European barbel.)

6. LEUCOGOBIO Günther.

Leucogobio GÜNTHER, Ann. Ac. Sci. Pétersburg, 1896, p. 212 (*herzensteini*).

Body oblong, slightly compressed. Head elongate; eye moderate; snout not projecting; mouth oblique, the jaws about equal, and the lips narrow and simple; the maxillary barbel sometimes as long as the eye; teeth 6 or 5 and 3, 2 or 1—6 or 5—5—3, 2 or 1; interorbital space broad; nostrils close together. Intestine short. Peritoneum generally silvery. Scales large, cycloid, and not imbricated. Dorsal inserted midway or in advance of space between tip of snout and base of caudal; caudal emarginate. Lateral line nearly straight or only slightly decurved and continuous. This genus is related to *Gobio*, differing in its mouth, which is like that of *Leuciscus*. It embraces two Chinese species, *Leucogobio herzensteini* and *Leucogobio tenuatus*, and four Japanese species.

(λευκός, white; gobio.)

- a* Dorsal generally inserted midway between the tip of the snout and the base of the caudal; young with a black spot at base of caudal.
- b* Body deep; caudal emarginate; sides with longitudinal brown bands. *güntheri*, 9.
- bb* Body more elongate; caudal very deeply emarginate; a bluish-black lateral band.*jordani*, 10.
- aa* Dorsal always inserted much nearer the tip of the snout than the base of caudal; young without black caudal spot; coloration more or less silvery.
- c* Body deep; eye 4 in head; color silvery.*mayeda*, 11.
- cc* Body elongate, rather slender; eye a little over 3 in head, above with a few brown spots.*biwa*, 12

9. LEUCOGOBIO GÜNTHERI Ishikawa.

Leucogobio güntheri ISHIKAWA, Annot. Zool. Japon., III, Pt. 4, April 30, 1901; p. 161; Maibara, Matsubara, etc., on Lake Biwa.

Head $3\frac{3}{5}$; depth $3\frac{3}{4}$; D. III, 7; A. III, 6; P. 15; V. 8; scales 38 in the lateral line; 6 scales in an oblique series between origin of dorsal and lateral line, and 6 scales between the latter and middle of belly; pharyngeal teeth 5, 3-3, 5; width of head $1\frac{4}{5}$ in its length; snout $2\frac{1}{2}$ in head; eye $4\frac{1}{2}$; interorbital space $2\frac{7}{8}$; pectoral $1\frac{2}{3}$; ventral $1\frac{2}{3}$.

Body moderately elongate, compressed, and rather deep. Head elongate, and pointed bluntly; snout bluntly rounded, a little longer than the eye and not projecting beyond the mandible; eyes anterior, moderately large, and $1\frac{1}{6}$ in snout; mouth rather large, oblique, so that the jaws meet in front on a level with the middle of the eyes and the maxillary reaches behind nearly to the front margin of the eye; lips somewhat broad and fleshy; a slender maxillary barbel about equal to the eye; pharyngeal teeth in 2 rows, several of the larger ones with grinding surface and those in the inner row small; nostrils together, in front and nearer the eye than tip of snout; interorbital space broad and slightly convex. Gill-openings large; gill-rakers short, and weak; pseudobranchiae large; gill-filaments long. Intestine short. Peritoneum silvery.

Scales large, of more or less uniform size, and cycloid; no pectoral flap; ventral flap present.

Origin of the dorsal in most cases midway between the tip of the snout and the base of the caudal, though when depressed not reaching over the origin of the anal; origin of the anal nearer that of the ventral than base of caudal, and when depressed reaching more than half way to the latter; caudal emarginate; pectoral about three-fifths of space to ventral; origin of ventral about under that of dorsal, and the fin reaching three-fifths the distance to anal. Caudal peduncle compressed, deep, and in its least depth 2 in head. Lateral line continuous, nearly straight, only very slightly decurved in front.

Color in alcohol dark brassy olivaceous brown above, and below pale or whitish with silvery reflections; along the sides are a series of pale

longitudinal stripes following in the series of scales, and that along the lateral line very much darker than the others; at the base of the caudal a blackish spot; dorsal, caudal, and pectoral brownish, the other fins pale; lips brownish.

Length, $3\frac{5}{8}$ inches.

This description from an example from Matsubara on Lake Biwa in Omi.

Fresh waters of central Japan. Our very numerous series of specimens are from Matsubara on Lake Biwa in Omi, Nagoya in Owari, Katata in Omi, and the Chikugo River at Kurume.

From Ishikawa's description of *Leucogobio jordani* we see little to distinguish it from the present species, although we hesitate to unite the two without further material. We have also not seen any specimens with 6 teeth in the larger row.

(Named for Dr. Albert Günther.)

10. LEUCOGOBIO JORDANI Ishikawa.

Leucogobio jordani ISHIKAWA, Annot. Zool. Japon., III, Pt. 4, April 30, 1901, p. 163; Lake Biwa at Shiwotsu and Matsubara.

Head 3 (in total); depth 6 (in total); D. 10; A. 7; V. 8; scales in lateral line 39—40; scales transversely $5\frac{1}{2}$ — $4\frac{1}{2}$; pharyngeal 6 or 5, 3—3, 5 or 6; eye $1\frac{1}{2}$ in interorbital space.

Head relatively long with the snout a little longer than the eye, which is a little less than the length of the head; mouth anterior, deeper than wide, its corner being halfway between the end of the snout and the anterior border of the eye; barbels minute, about two-thirds the diameter of the pupil. Pharyngeal teeth hooked at the end. Intestinal tract with only a single convolution. Peritoneum with a few pigments of brownish color. Number of vertebrae 33, of which 14 enter into the tail.

There are about 3 series of scales between the lateral line and the ventral fin.

Origin of the dorsal slightly in advance of the root of the ventral, and just in midway between the end of the snout and the root of the caudal; caudal fin very deeply emarginate; pectoral fin about half the length of the head, without snout and terminating a long way from the root of the ventral; ventral shorter than the pectoral and terminating in front of the vent.

Color silvery; back dark brownish, and a bluish-black band on the side of the body; a small triangular spot of a deeper color at the root of the caudal is very distinct in small individuals.

Length 78 mm. (about $3\frac{1}{8}$ inches).

Shiwotsu and Matsubara on Lake Biwa. (Ishikawa.)

This species, not seen by us, is said to differ in a marked way from *Leucogobio güntheri* by its slender form, its longer head, and its longer

and deeper emarginated caudal. According to the figure the pectoral fin is represented as nearly two-thirds the length of the head, including snout, or about equal to the space between the middle of the eye and the posterior margin of the gill-opening.

(Named for Dr. David Starr Jordan.)

11. LEUCOGOBIO MAYEDÆ (Jordan and Snyder).

Gobio mayeda JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 342, pl. IX, fig. 2; Lake Biwa, near Karasaki.—JORDAN and SNYDER, Check-List Fish. Japan, III, April 3, 1901, p. 46; Lake Biwa.

Head $4\frac{1}{2}$; depth $4\frac{1}{3}$; D. III, 7; A. III, 6; P. 16; V. 8; scales in lateral line 42; 5 scales between origin of dorsal and lateral line, and 6 scales between the latter and the middle of the belly; pharyngeal teeth 5, 3—3, 5; width of head a little less than 2 in its length; snout $3\frac{3}{4}$ in head; eye 4; interorbital space $3\frac{1}{2}$; pectoral $1\frac{2}{5}$; ventral $1\frac{1}{2}$.

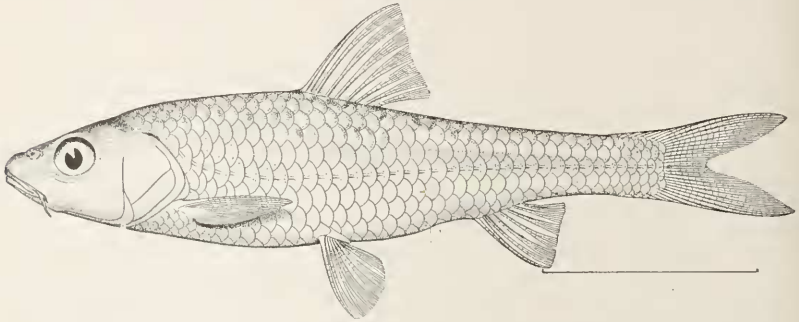


FIG. 3.—LEUCOGOBIO MAYEDÆ.

Body elongate, oblong and compressed. Head elongate, compressed; snout rather bluntly rounded, and a trifle longer than the eye; eyes moderate, anterior; mouth oblique, protractile, the jaws about equal and the maxillary not reaching to the front of the eye; lips somewhat fleshy; a small maxillary barbel; pharyngeal teeth in the larger row with narrow grinding surface, and some of them slightly hooked; nostrils close together, in front of the eye above and also a little before the end of the maxillary; interorbital space broad and slightly convex. Gill-openings large and the membrane rather broadly joined to the isthmus; gillrakers short, few, and weak; pseudo branchia large; gill-filaments rather long. Intestine short. Peritoneum silvery.

Scales rather large, of more or less uniform size, and cycloid; head naked; no pectoral flap and the ventrals with a well developed flap.

Origin of dorsal much in advance of the middle of the body without caudal, and the tip of the first developed ray reaching as far posteriorly as the tip of the last when the fin is depressed; origin of anal entirely behind dorsal and when the fin is depressed it does not reach quite half the distance to base of caudal; caudal deeply emarginate,

and the lobes pointed; pectoral falling rather in front of the origin of dorsal, and about three-fifths of the space to ventrals; origin of ventrals a trifle behind the origin of the dorsal, and reaching about three-fifths in the space to the origin of anal. Caudal peduncle compressed, rather long, and its least depth $2\frac{1}{3}$ in head. Lateral line continuous along the sides, and almost straight.

Color in alcohol brown, pale or whitish below, and the body more or less silvery on the sides and lower parts; a pale longitudinal band, becoming darker along the caudal peduncle, along the sides; fins tinted with brown, except the ventrals and anal, which are pale like the lower surface.

Length $4\frac{3}{4}$ inches.

This description from a specimen from Lake Biwa at Matsubara.

Fresh waters of southern Japan, very abundant in Lake Biwa.

Our many specimens are from near Karasaki, Lake Biwa (cotypes), no. 6272, Ichthyological collections Leland Stanford Junior University Museum (collection K. Otaki)) Lake Biwa at Matsubara and Ise, the Yodo River at Osaka in Settsu, the Chikugo River at Hirume, and from near Nagoya in Owari.

In young examples the fins are longer, and the lateral band more distinct posteriorly but without a dark spot at the base of the caudal. (Named for Kinichiro Mayeda, a Japanese student in Leland Stanford Junior University.)

12. LEUCOGOBIO BIWÆ (Jordan and Snyder).

Gobio biwæ JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 340, pl. IX, fig. 1; Lake Biwa near Matsubara.—JORDAN and SNYDER, Check List Fish. Japan, III, April 3, 1901, p. 46; Lake Biwa.

Head 4; depth about 6; D. III, 7; A. III, 6; P. 17; V. 8; scales in the lateral line; 4 scales between the origin of dorsal and lateral line, and 6 scales between the latter and middle of belly; pharyngeal teeth 5, 3-3, 5; width of head 2 in its length; eye a little over 3; interorbital space $4\frac{1}{4}$; pectoral $1\frac{1}{3}$; ventral $1\frac{1}{2}$.

Body elongate, rather slender and compressed. Head elongate, compressed, and somewhat pointed in front; snout rather long, bluntly rounded, and a little shorter than the eye; eyes large lateral and anterior; mouth oblique, inferior, protractile, the jaws equal, and the maxillary reaching almost to the front of the eye; the jaws meet about level with the lower margin of the eye; lips somewhat fleshy; a maxillary preopercle equal to about two-thirds the orbit; several pharyngeal teeth in the larger row with narrow grinding surfaces; nostrils together and far in front of the eye; interorbital space broad and flattened. Gill-openings large; gillrakers short, few, and weak; pseudobranchia well developed; gill-filaments rather long. Intestine short. Peritoneum with a little dusty coloring.

Scales rather large, of more or less uniform size, and cycloid; head naked; no pectoral flap; ventral flap small.

Origin of dorsal much in advance of the middle of the body without caudal, and the tip of the first developed ray reaching as far posteriorly as the tip of the last when the fin is depressed; origin of anal behind tip of depressed dorsal a trifle nearer the origin of the ventral than base of caudal, and the fin reaching about halfway in the space between; caudal deeply emarginate and the lobes pointed; pectoral reaching almost to the origin of dorsal and about three-fourths in the space to origin of ventral; ventral behind origin of dorsal, and about three-fifths in the space to anal. Caudal peduncle compressed, rather long, and its least depth about equal to the eye. Lateral line continuous along the sides, very slightly decurved in front.

Color, in alcohol, brown, pale or whitish washed with silvery below; above the lateral line and upon the upper surface of the head with fine

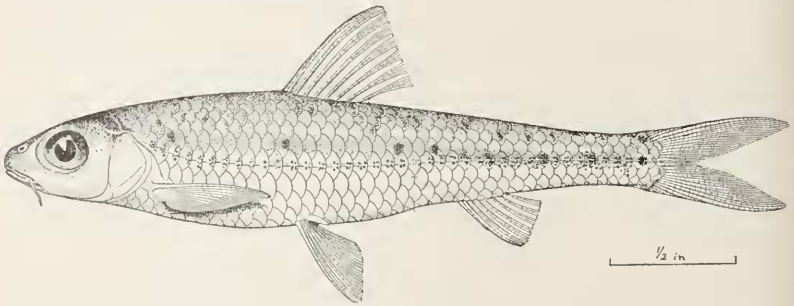


FIG. 4.—LEUCOGOBIO BIWAENSE.

black dots grouped together on the edges of the scales in small spots and distributed irregularly; lateral line with a row of dark spots; a median lateral pale brown longitudinal band; all fins except ventrals with some dark color.

Length, $3\frac{1}{6}$ inches.

Described from No. 6273, Ichthyological Collections, Leland Stanford Junior University Museum, cotype, from Lake Biwa, near Matsubara, from collection of C. Ishikawa.

This species is only known to us from Lake Biwa, near Matsubara. With the exception of the two specimens before us and the type, we know of no other specimens.

(*Biwa*, the samisen, also the loquat tree, the name of the largest lake in Japan.)

7. PSEUDOGOBIO Bleeker.

Pseudogobio BLEEKER, Atlas Ichthyol., Cyprin., 1863, p. 29, (*esocinus*).

Body elongate, rather slender and tapering behind. Head elongate, pointed; snout long, concave above, and slightly produced, with its tip bluntly rounded; eye small, nearer posterior edge of opercle than

tip of snout; mouth small, protractile downwards, inferior, the maxillary not reaching nostrils; lips broad, fleshy, and covered with well-developed papillæ; a rather short, thick, maxillary barbel; teeth small, 6 or 5, 2—2, 5 or 6; interorbital space broad and concave. Intestine short. Peritoneum silvery. Scales moderate, cycloid, about 2. Origin of dorsal nearer tip of snout than base of caudal; origin of anal far behind tip of depressed ventral; caudal emarginate; ventrals inserted well behind origin of dorsal. Lateral line almost straight or very slightly decurved and continuous. Dorsal and caudal with distinct narrow blackish cross-bands.

Streams of Japan and Formosa.

(*ψεύς* false; *gobio*.)

13. PSEUDOGOPIO ESOCINUS (Schlegel).

KAMASUKA (SCYTHE FISH): KAWASAKI (RIVER-POINT).

Gobio esocinus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 196, pl. xcix, fig. 2, near Nagasaki.

Pseudogobio esocinus GÜNTHER, Cat. Fish., VII, 1868, p. 175: from one of Schlegel's types.—SAUVAGE, Bull. Soc. Philom., Paris, 1883, p. 3 reprint; Lake Biwa.—ISHIKAWA, Prel. Cat., 1897, p. 15; Yeshigo, Tama, Chichibu, Suwa, Shinshu, Owari, Lake Biwa at Matsubara, Katsura R., Yamashiro, Kyoto, Kuruma.—JORDAN and SNYDER, Check List, 1901, p. 46; Lake Biwa.

Head $3\frac{3}{5}$; depth 6; D. II, 8; A. II, 7; P. 16; V. 8; scales 42 in the lateral line; 5 scales in an oblique series between origin of dorsal and lateral line, and 5 scales between the latter and middle of belly; pharyngeal teeth 6 or 5, 2—2, 5 or 6; width of head 2 in its length; snout 2 in head; eye 5; interorbital space $4\frac{1}{4}$; pectoral $1\frac{2}{5}$; ventral $1\frac{2}{3}$.

Body elongate, rather slender, tapering behind, and somewhat compressed. Head elongate, pointed, and compressed; snout long, compressed, concave above, and slightly produced beyond the mandible, the tip bluntly rounded; eye rather small, $2\frac{3}{5}$ in snout, high, and nearer the posterior edge of opercle than the tip of the snout; mouth small, protractile downwards, and inferior, the maxillary not reaching posteriorly as far as the nostrils; lips very broad and fleshy, and covered with well-developed papillæ, a rather short thick maxillary barbel equal to two-thirds the eye; pharyngeal teeth small, slender, compressed, hooked, and those in the lesser row very small and feeble; nostrils together and nearer the eye by two-thirds the length of the snout; interorbital space broad and concave, and the top of the head also concave. Gill-openings large and the membranes broadly united to the isthmus, forming a rather fleshy flap on each side below; gill-rakers developed as numerous soft stumpy excrescences; gill-filaments long and very numerous. Intestine with a single convolution. Peritoneum silvery.

Scales large and cycloid, none on the breast; no pectoral flap; ventral flap present.

Origin of the dorsal nearer the tip of the snout than the base of the caudal by the length of the snout; the anterior developed dorsal rays extending beyond the tips of the last when the fin is depressed, and the upper edge of the fin straight or emarginate; origin of the anal about midway between the tip of the depressed dorsal and the base of the caudal, and the fin reaching two-thirds the distance to base of caudal; caudal deeply emarginate and the lobes pointed; pectoral broad, rounded, and reaching beyond the origin of the dorsal, and almost to the origin of the ventral; origin of ventral well behind the origin of the dorsal, and when depressed extending for half the space to origin of anal. Caudal peduncle rather short and compressed, its least depth about 4 in head. Lateral line nearly straight and continuous to the base of the caudal.

Color in alcohol dark brown above, pale or whitish below and washed with silvery; upper surface of the body speckled with darker brown spots, the sides with a series of about 12 large brownish spots along the lateral line; dorsal and caudal with 5 or 6 narrow blackish cross lines; pectoral with a few brown spots, the ventrals and anal pale; barbels and lips pale.

Length $7\frac{1}{8}$ inches.

This description from an example from Lake Biwa at Matsubara.

Of this species we have numerous specimens from Lake Biwa at Matsubara, the Kitakami River at Morioka, Matsushima, the Kinu River at Utsunomiya, the Chikugo River at Kurume, Tsuruga in Echizen, the Yodo River in Osaka, Kawatana in Hizen, the Iwai River at Ichinoseki, Kaminutani River in Omi, and an example from the collection from Karasaki, Lake Biwa, from K. Otaki.

It is one of the commonest of Japanese fishes, lying on the bottom among the rocks or weeds, in the fashion of the American species of *Hypobopsis*.

(*esocinus*, pike-like.)

8. SARCOCHEILICHTHYS Bleeker.

Sarcocheilichthys BLEEKER, Cyprin. Prodr., 1860, p. 426 (*variegatus*).

Body elongate, oblong, and compressed. Head elongate, bluntly pointed, and compressed; snout blunt and obtusely rounded; eye small; mouth small, inferior; lips rather thick and fleshy; a very small and short maxillary barbel; teeth, 5—5; interorbital space, convex. Intestine short. Peritoneum silvery. Scales rather small, 42. Origin of dorsal nearer tip of snout than base of caudal; anal inserted below tip of depressed dorsal; caudal emarginate; ventrils inserted a little behind origin of dorsal. Lateral line almost straight and continuous. Breeding males with horny tubercles on snout and sides of head. Japanese species, resembling those of the American genus *Semotilus*.

(σάρξ, flesh; χεῖλος, lip; ἰχθύς, fish.)

14. SARCOCHEILICHTHYS VARIEGATUS (Schlegel).

HIGOI (SCARLET CARP), ABURAHAE (FAT MINNOW).

Leuciscus variegatus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 213, pl. cii, fig. 2; Nagasaki.

Pseudogobio variegatus GÜNTHER, Cat. Fish., VII, 1868, p. 175; after notes of Bleeker on Schlegel's type.—ISHIKAWA, Zool. Mag. Tokyo, VII, August, 1895, p. 125; Otsu, Matsubara, and Maebara on Lake Biwa; Prel. Cat., 1897, p. 15; Lake Biwa, Maebara; Matsubara, Zensho, Tsuyama, Minasuka R., Kii.—SAUVAGE, Bull. Soc. Philom., 1883, p. 2, Lake Biwa.

Sarcocheilichthys variegatus JORDAN and SNYDER, Check List, 1901, p. 46; Lake Biwa.

Head $3\frac{2}{5}$; depth 4; D. III, 8; A. II, 7; P. 15; V. 8; scales 42 in the lateral line; 5 scales between origin of dorsal and lateral line, and 6 scales between the latter and middle of belly; pharyngeal teeth 5-5; width of head $1\frac{4}{5}$ in its length; snout $2\frac{3}{4}$ in head; eye $5\frac{1}{2}$; interorbital space $3\frac{1}{4}$; pectoral $1\frac{1}{3}$; ventral $1\frac{1}{2}$.

Body elongate, oblong, moderately deep and compressed. Head elongate, bluntly pointed and compressed; snout moderately long, compressed, very blunt, obtusely rounded and not protruding beyond the jaws; eye small, rather high, 2 in snout, and anterior in the head; mouth small, inferior and protractile, the maxillary reaching as far posteriorly as the posterior nostril; lips thick, rather broad and fleshy, and the lower broadly separated by the hard, rounded, horny symphysis; a very small and short maxillary barbel; pharyngeal teeth hardly hooked, and with broad grinding surfaces; nostrils rather large, close together, and much nearer the eye than tip of snout; interorbital space broad and convex, and the top of the head also convex. Gill-openings large, and the membranes broadly joined to the isthmus; gill-rakers few, short, and weak; pseudobranchiae well developed. Intestine with a single convolution. Peritoneum silvery.

Scales large, cycloid, and imbricated along the sides; no pectoral flap; ventrals with a scaly flap at base.

Origin of the dorsal nearer the tip of snout than the base of the caudal by a space a little less than snout, the upper edge of the fin straight on, only very slightly concave, so that when depressed the tip of the first developed ray reaches posteriorly as far as the tip of the last; anal beginning much nearer the origin of ventrals than base of caudal, and the fin reaches more than half way to the latter; caudal forked and the lobes pointed; pectoral rounded and extending two-thirds the distance to base of ventral; ventrals entirely behind origin of dorsal, and extending posteriorly two-thirds the distance to anal. Caudal peduncle rather long, compressed, and its least depth $2\frac{1}{3}$ in head. Lateral line continuous and nearly straight along the sides.

Color in alcohol, dark brown above, below pale, or whitish washed with silvery, the sides more or less brassy; edges of most of the scales above and on the sides marked with brown; the sides along the lateral

line with a rather broad, brassy-brown longitudinal band, becoming most distinct along the caudal peduncle: a black spot behind edge of opercle; fins all more less tinged with brown, the dorsal with a trace of a dark cross bar. Male deep steel blue in life, a dark lateral shade interrupted on tail to form a caudal spot. Dorsal rosy tinted above. Caudal and anal bright yellow; pectoral and ventral with a scarlet area, head pink below.

Length, $7\frac{9}{16}$ inches.

This description from an adult male taken at Matsubara on Lake Biwa.

Fresh waters of southern Japan, very abundant, our many specimens from Matsubara on Lake Biwa, the Yodo River at Osaka in Settsu, the Chikugo River at Kurume in Chikugo, Lake Yogo near Nagoya, Funayado in Kiusiu, Tsuchiura, and Tokyo.

The young of this species differs in color from the adult, as the markings are much more distinct. The dorsal fin is pale, like the ventrals or anal, and is crossed by a jet black bar. The lateral band is also very distinct and generally results in a black blotch at the base of the caudal. As they grow older these markings become more indistinct. During the breeding season the snout of the male becomes covered with horny tubercles like those found in certain species of *Hybopsis*, *Notropis*, etc.

The following notes are given in a "Preliminary Note on the Fishes of Lake Biwa:"^a

Young with yellowish ocher above, the dorsum bluish tinted; scales of sky-blue in front of dorsal; irregular sepia-brown markings, forming a straight line along lateral line, below which the ground color of the body fades away into a pale blue; sepia-brown blotches along the back; head with sepia-brown markings on upper jaw, inter-orbital space, and neck. Pupil, indigo-black, surrounded by sky-blue; fins yellowish ocher, the ends of dorsal, ventral, anal, and middle of caudal lighter; a row of elongated black streaks on upper third of dorsal between fin-rays.

Larger specimens brown above and on caudal; sides of head bluish, passing gradually to light crimson toward the ventral side; lips pale blue; pupil black with a crimson ring; dorsal third of body darker brown with traces of indigo; dorsal two-thirds of body covered with sepia-colored scales; dorsal, pectoral, ventral, and anal light brown with indigo on anterior parts of dorsal and ventral; ventrals and anal edged with light indigo; basal third of caudal with longitudinal streaks of brown.

Upper half of body deep indigo-blue, with scattered, darker-colored scales; below yellowish, quite light on ventrum, and with scattered golden yellow scales; ground color of head reddish yellow, the dorsal portion dirty green; eye deep indigo with crimson and indigo streaks around; dorsal and caudal greenish ocher; ventrals and anal white, with yellow stripes.

(*variegatus*, varied.)

^aZool. Mag., VII (Tokyo), Aug., 1895, pp. 125-127, by Dr. Ishikawa.

9. ABBOTTINA Jordan and Fowler.

Abbottina JORDAN and FOWLER, new genus (*psegma*).

Body elongate, oblong and compressed. Head elongate, pointed; snout elongate, compressed, concave above, and slightly produced, with the tip bluntly rounded; eye small, high, and midway in head; mouth small, inferior, protractile downward, and the maxillary not reaching eye; lips fleshy, not papillose; barbels moderate, one on each maxillary; teeth 5—5; interorbital space flat. Intestine short. Peritoneum silvery. Scales large, about 38, none on breast. Origin of dorsal nearer tip of snout than base of caudal, and inserted far behind base of last dorsal ray; caudal emarginate; ventral inserted a little behind the middle of the base of the dorsal.

Lateral line slightly decurved on the first 3 or 4 scales, after which it is straight and continuous. Dorsal and caudal with several dark, well-defined crossbars, as in *Pseudogobio*, which it resembles, but is easily distinguished by its smooth lips. Breeding males have the median dorsal rays enlarged, so that the fin is very large.

(Named for James Francis Abbott, late of Stanford University, since professor in the Japanese Military Academy at Etajima, who assisted Professors Jordan and Snyder in their work on Lake Biwa, Lake Yogo, Yodo River, and at Tsuruga and Misaki.)

15. ABBOTTINA PSEGMA Jordan and Fowler, new species.

Head, $3\frac{1}{2}$; depth, $4\frac{1}{3}$. D. II, 8; A. II, 8; P. I, 11; V. 8; scales 38 in the lateral line; 5 scales in an oblique series between the origin of the dorsal and about 6 between the latter and the middle of the belly; pharyngeal teeth 5—5; width of head $1\frac{3}{4}$ in its length; snout $2\frac{1}{4}$ in head; eye 5; interorbital space $3\frac{1}{3}$; pectoral a little shorter than the head; ventral $1\frac{1}{2}$.

Body elongate, oblong, moderately deep, and compressed. Head elongate, pointed, and compressed; snout elongate, compressed, concave above and slightly produced beyond the mandibles, the tip bluntly rounded; eye small, $2\frac{2}{3}$ in snout, high, and about midway in the length of the head; mouth small, inferior, and protractile downward, the maxillary reaching posteriorly beyond the nostrils, but not to the anterior margin of the eye; lips moderately broad, thick, and fleshy, but not covered with distinct papillæ, as they are perfectly smooth; barbel short, thick, and about equal to two-thirds the diameter of the eye; pharyngeal teeth small, weak, with a narrow grinding surface and slightly hooked; nostrils together, rather large, and nearer the eye than the tip of snout; interorbital space broad and flat, the top of the head also rather flat. Gill openings large, the gill membranes forming a rather fleshy flap on each side, below; gill rakers short,

weak, fleshy, and in moderate number; gill filaments long; pseudo-branchiæ well developed. Intestine with a single convolution. Peritoneum silvery.

Scales large and cycloid, none on the breast; no pectoral flap; ventral flap short.

Origin of the dorsal nearer the tip of the snout than the base of the caudal by the length of the snout, and the upper edge of the fin greatly convex on account of the great length of the median rays, so that when it is depressed it reaches posteriorly nearly to the base of the penultimate anal ray, and its length is equal to $2\frac{2}{5}$ in the body without caudal; origin of anal at about the last two-fifths of the space between origin of dorsal and base of caudal, and when depressed reaching about to the latter; caudal rather deeply emarginate, and the lobes pointed; pectoral long, the first rudimentary ray stout and strong, and the tip of the fin reaching beyond the origin of the dorsal,

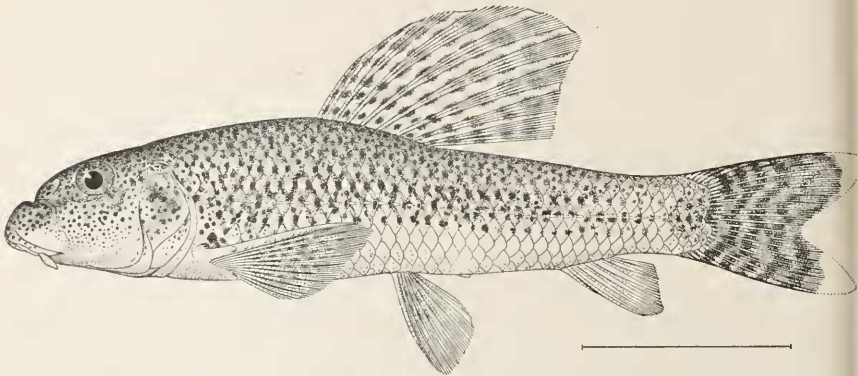


FIG. 5.—ABBOTTINA PSEGMA.

but not quite to the base of ventral; ventrals inserted a little nearer origin of anal than that of pectoral, and reaching for two-thirds the space to the former. Caudal peduncle rather short and compressed, its least depth $2\frac{3}{5}$ in head. Lateral line slightly deurved on the first 3 or 4 scales, after which it is straight and continuous.

Color in alcohol, dark, rich brown above, below whitish and silvery, and the sides and upper surface specked and spotted with dark brown, very distinct on the latter; dorsal and caudal with narrow, blackish crossbars, the pectoral also with blackish spots above, and the ventrals and anal pale; axil of pectoral with a black spot; lips and barbels pale; length $4\frac{1}{2}$ inches.

Type No. 7721, Ichthyological Collections, Leland Stanford Junior University Museum. Locality, Yodo River at Osaka in Settsu. Cotype No. 50765, United States National Museum and Nos. 7721, 7148, Leland Stanford Junior University.

We have many specimens from the Yodo River at Osaka in Settsu, the Chikugo River at Kurume, and the Iwai River in Ichinoseki in Rikuchu.

In nonbreeding males, females, and young, the middle dorsal rays are not elongated, the upper edge of the fin being straight, and the sides are marked with rather large and distinct dark blotches.

(ψέγμα, dust.)

10. ZEZEBA Jordan and Fowler.

Zezeba JORDAN and FOWLER, new genus (*hilgendorfi*).

Body elongate, oblong, and compressed. Head rather small, depressed, and pointed, the upper and lower profiles straight; snout long; eye rather small; mouth small, terminal, oblique; upper lips rather broad; barbels 2; rather long, but shorter than eye; teeth small, 5—5; interorbital space broad and flattened. Intestine short. Peritoneum silvery. Scales small, cycloid, and not imbricated; 42 in the lateral line. Origin of dorsal midway between tip of snout and base of caudal; anal inserted behind tip of depressed dorsal; caudal emarginate; ventral inserted slightly before origin of dorsal. Caudal peduncle rather deep and compressed. Lateral line straight and continuous.

(*Zezeba*, Japanese name of a small minnow, from *Zeze*, a village at the head of the Yodo River on Lake Biwa, remarkable for its very long bridge, one of the "seven wonders of Omi.")

16. ZEZEBA HILGENDORFI (Ishikawa).

Sarcocheilichthys hilgendorfi ISHIKAWA, new species of Japanese fishes Ms. 1902.

Head $4\frac{1}{2}$; depth $3\frac{2}{3}$; D. III, 7; A. III, 6; P. 16; V. 8; scales 42 in the lateral line; 6 scales between origin of dorsal and lateral line, and 6 between latter and middle of belly; pharyngeal teeth 5—5; width of head $1\frac{1}{2}$ in its length; snout 3 in head; eye $4\frac{1}{4}$; interorbital space $2\frac{1}{4}$; pectoral $1\frac{2}{5}$; ventral $1\frac{1}{3}$.

Body elongate, oblong, and compressed. Head rather small, depressed, elongated, pointed, and the upper and lower profiles straight; snout long, pointed; eye rather small, anterior, and about $1\frac{2}{3}$ in snout; mouth small, terminal, very oblique, the mandible slightly produced in front, the maxillary protractile and not reaching the nostril; upper lips rather fleshy and dilated, the edge of the mandible more or less horny in the middle; maxillaries each with a barbel that is less than the eye; teeth small, weak, and hooked; nostrils close together on the sides of the snout and nearer the posterior extremity of the maxillary than the anterior margin of the eye; interorbital space broad and flattened, or only very slightly convex. Gill-opening rather restricted; gill-rakers small, few and weak; pseudobranchia present. Intestine short. Peritoneum silvery.

Scales moderate, cycloid, and not imbricated; no pectoral flap; ventral flap present.

Origin of the dorsal midway between tip of snout and base of caudal, the anterior rays the longest, and when depressed, the tip of the fin does not reach the origin of the anal; anal inserted a little nearer base of caudal than tip of pectoral, the fin short and reaching half way to base of caudal; caudal rather deep, emarginate; pectorals reaching about two-thirds the distance to origin of anal; ventral inserted slightly before the origin of the dorsal, or a little nearer the origin of the anal than that of the pectoral, and reaching two-thirds the distance to former.

Caudal peduncle deep and compressed, its least depth about $1\frac{2}{3}$ in the head. Lateral line straight and continuous.

Color, in alcohol, dark brown, tinted with dull olivaceous above, below pale or whitish; the lateral line is within a broad, deep brown, lateral band, which really begins on the snout, passing through the eye and backwards, even upon the middle caudal rays; lips pale; some of the scales on the lower portions of the sides tinted with pale brown; dorsal, caudal, and pectorals grayish, the other fins pale like the belly.

Length $4\frac{1}{2}$ inches.

We have but two examples of this species, the specimen described (No. 7722 L. S. Jr. Univ.) above from Funayado, in Kiusiu, the other in the U. S. National Museum, from the Kamo River, in Yamashiro, from the collection of the Imperial University. Dr. Ishikawa's specimens, the types of the species, came from the Ahasi River, in Mimisaku. (Named for Dr. Franz Hilgendorf.)

11. BIWIA Jordan and Fowler.

Biwia JORDAN and FOWLER, new genus (*zezera*).

Body elongate, compressed, rather thick, and somewhat broad forward. Head small, and below, together with the interorbital region, broad and flattened; snout bluntly rounded and produced; eye rather large; mouth small, inferior, the broad suborbitals overlapping on each side; no barbels; teeth, 5—5; interorbital space more or less flattened. Inside of gill-opening with a deep notch below. Intestine short. Peritoneum silvery. Scales large, imbricated, cycloid and about 33; no scales on the breast. Origin of dorsal midway between tip of snout and base of last anal ray, the radii 7; anal short, the radii 6, and its origin behind tip of depressed dorsal; caudal emarginate; ventrals inserted about opposite the middle of the base of dorsal. Lateral line straight after the first 3 or 4 scales, and continuous. This genus is close to *Pseudorasbora*, the latter differing principally in the deep notch inside the gill-opening below. *Biwia* differs also in the form of the mouth, which is small, inferior, and ensheathed on each side by the broad suborbitals.

(Named for Lake Biwa.)

17. BIWIA ZEZEKA (Ishikawa).

ZEZEKA.

Pseudogobio zezeza ISHIKAWA, Zool. Mag., VII, 1895, p. 127, with plate; Lake Biwa at Otsu, Maebara and Matsubara; Prel. Cat., 1897, p. 16; same localities; also Zensho and Tsubayama River.

Head $4\frac{1}{3}$; depth $4\frac{2}{5}$; D. III, 7; A. III, 6; scales 33 in the lateral line; 4 scales between the origin of the dorsal and the lateral line, and 5 between the latter and the middle of the belly; pharyngeal teeth not examined, but probably 5—5; width of head $1\frac{1}{2}$ in its length; snout 4 in head; eye $3\frac{2}{3}$; interorbital space 3; pectoral a little less than head; ventral $1\frac{1}{4}$.

Body elongate, compressed, and somewhat broad forward. Head rather small, thick, and below, together with the inter-pectoral region, broad and flattened; snout very bluntly rounded and produced; eye moderate, high, anterior, and a little longer than snout; mouth small, inferior, the broad suborbitals overlapping on each side; lips very thin; no barbels; nostrils large, close together, on each side of the snout, and the internasal space much less than the interorbital space; top of head and interorbital space flattened, the latter much broader than the eye. Gill-openings moderate, inside and below with a deep notch, gill-rakers very small and weak; pseudobranchiæ small. Intestine short. Peritoneum silvery.

Scales large, cycloid, of more or less even size; and those on the sides imbricated; no scales on breast; no pectoral flap; no ventral flap.

Origin of dorsal about midway between tip of snout and base of last anal ray; the anterior rays the highest; the base of the fin about $1\frac{1}{3}$ in the head; the length of the fin, when depressed, $3\frac{1}{3}$ in body without caudal, and the margin of the fin convex; anal beginning well behind tip of depressed dorsal, or about midway between the origin of the ventral and the base of caudal, the anterior rays the longest, the base of the fin short, and when depressed, the tip of the fin reaches two-thirds the distance to base of caudal; caudal emarginate; pectorals with the outer rudimentary ray enlarged and stiffened and reaching three-fourths of the distance to ventrals; ventrals inserted about opposite the middle of base of dorsal, or a little nearer the base of caudal than tip of snout, and reaching three-fourths of the distance to origin of anal. Caudal peduncle compressed, its least depth 2 in head. Lateral line almost straight, only slightly decurved upon the first three or four scales of its course.

Color in alcohol, brown, darker above, the lower surface pale or silvery; top of head and snout brownish; edge of each scale dark brown, so that a well-defined reticulated color pattern is present; fins all more or less grayish, the dorsal and caudal with some dark brown mottlings or blotches; a series of round dark blotches along the sides.

Length, $2\frac{1}{16}$ inches.

This description from an example from the Yodo River at Osaka, the only locality where the species was obtained by us. We do not hesitate to identify these specimens with Ishikawa's *Pseudogobio zezera*, as the characters in the main agree. However, he does not mention a notch inside the gill opening, a character also shared with *Pseudorasbora*.

The original description is as follows:

Head a little less than 5; depth 5; D. I, 8; A. I, 7; scales 38 in the lateral line, transversely $4\frac{1}{2}$ above and $3\frac{1}{2}$ below; pharyngeal teeth 5—5; eye $3\frac{1}{2}$ in head; snout with the front end abruptly turned down, forming a rounded angle with the upper side; eye large; mouth inferior, horseshoe shaped, very small; barbels none; lower jaw with pendant, lateral lips; pharyngeal teeth arranged in two groups of 3 and 2. Origin of dorsal fin much nearer to end of snout than base of caudal. General color, shining, yellowish ocher, below silvery; a series of round, blackish blotches along lateral line; a similar blotch sometimes present on the occiput, and also along the dorsum; 3 to 4 series of small black spots on the dorsal and the ventrals. Otsu, Maebara, and Matsubara, Lake Biwa (Ishikawa).

12. PSEUDORASBORA Bleeker.

Pseudorasbora BLEEKER, Act. Soc. Indo-Neerl. Japan, VI, 1860, p. 97 (*parva*).

Body elongate. Head pointed, compressed; snout bluntly pointed; eye rather large; mouth terminal above, oblique, the mandible projecting, and the maxillary not reaching nostril; no barbels; teeth 5—5; interorbital space broad and flat. Inside of gill opening with a notch below. Intestine short. Peritoneum silvery. Scales large, cycloid, and about 38; breast scaled. Origin of dorsal nearer tip of snout than base of caudal; origin of anal begins below tip of depressed dorsal; caudal emarginate; ventrals inserted below origin of dorsal. Lateral line slightly decurved and continuous. Breeding males with the snout and sides of the head with horny tubercles.

Small fishes of Japan and China.

(*ψευδης*, false; *rashora*, a related genus.)

18. PSEUDORASBORA PARVA (Schlegel).

MOROKO: HAYA.

Leuciscus parvus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 215, pl. cu, fig. 3; streams about Nagasaki.

Pseudorasbora parva KNER, Novara Fische, 1867, p. 355, pl. xvi, fig. 2; Shanghai (called *Opsarus parvus* on plate).—GÜNTHER, Cat. Fish., VII, 1868, p. 186; Japan, Chi Kiang, China.—ISHIKAWA, Zool. Mag., VII, 1875, p. 128; Otsu, Maebara, Matsubara; Prel. Cat., 1897, p. 14; same localities, also Yodo River, Yoga Lake, Shima and Zensho.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 344; Karasaki, Lake Biwa; Annot. Zool. Jap., III, 1901, p. 48; Lake Biwa.

Leuciscus pusillus SCHLEGEL, Fauna Japonica, Poiss., p. 216, pl. cu, fig. 4; near Nagasaki.

Head $4\frac{1}{3}$; depth 4; D. III, 7; A. II, 6; P. I, 13; V. 8; scales 38 in the lateral line; 5 scales between origin of dorsal and lateral line, and 5 between the latter and the middle of the belly; pharyngeal teeth 5—5; width of head $1\frac{2}{3}$ in its length; snout $3\frac{1}{2}$ in head; eye $3\frac{2}{3}$; interorbital space a little less than half the head; pectoral $1\frac{1}{2}$; ventral $1\frac{1}{3}$.

Body elongate and compressed. Head pointed (compressed), the upper and the lower surface and the sides more or less flattened; snout bluntly pointed; eye rather large, anterior; mouth obliquely vertical and projecting in front the maxillary protractile, and not reaching front of nostril; no barbels; pharyngeal teeth rather small and hooked; nostrils close together in front of the eye above; interorbital space broad, nearly flat. Gill-openings moderate, lateral; gill-rakers merely fleshy rudiments; pseudobranchiæ developed. Intestine short and with few turns. Peritoneum silvery.

Scales rather large, of more or less even size, and cycloid: pectorals with a narrow, fleshy flap; ventral flap moderate, pointed.

Origin of dorsal anterior, nearer tip of snout than base of caudal, the anterior rays the highest, the base of the fin $1\frac{1}{2}$ in head, and the margin of the fin slightly convex; origin of anal much nearer tip of pectoral than base of caudal, small and similar to dorsal in shape; caudal emarginate, the lobes roundly pointed; pectorals reach about two-thirds the distance to ventrals; ventrals inserted below the origin of the dorsal and reaching two-thirds the distance to origin of anal. Caudal peduncle rather long; compressed, and a trifle more than the space between origins of pectoral and ventral. Lateral line almost straight, or only very slightly decurved, and continuous.

Color in alcohol, very dark grayish brown or black above, the sides and lower surface more or less silvery, each scale with a brown spot; sides with a pale, slaty gray lateral band, most distinct posteriorly; all the fins grayish brown or black, and more or less indistinctly spotted or speckled with darker.

In life the adult is golden yellow, the male with nuptial tubercles.

Length, $3\frac{7}{8}$ inches.

Here described from an example from Tsuchiura, near Tokyo. This very abundant minnow is represented in our collections by very many series of specimens from Tsuchiura, near Nagoya in Owari, Lake Yogo near Nakanogo in Mino, Lake Biwa at Matsubara, the Iwai River at Ichinoseki, the Chikugo River at Kurume, the Yodo River at Osaka, and several examples from the collection of K. Otaki, from Karasaki on Lake Biwa.

(*parrus*, small).

13. OTAKIA Jordan and Snyder.

Otakia JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 345 (*rashorina*).

Body elongate; head elongate, eye large, anterior; mouth very oblique, lower jaw included, the maxillary protractile, and not reaching eye; no barbels; teeth 5, 2—2, 5, slender, hooked, and with a scarcely discernible grinding surface in two rows. Gill-rakers on first arch slender, pointed; pseudobranchiæ present. Air-bladder large, with a median constriction. Alimentary canal short. Peritoneum silvery. Dorsal inserted a little in advance of ventrals, of 8 developed rays, the anterior rays weak, and the edge of the fin concave; anal of similar shape, with 7 rays; caudal deeply notched, the tips pointed. Lateral line straight after the first 4 or 5 scales, where it is slightly decurved, and then continuous.

Color, light, with a silvery, lateral band.

Species of small size.

(Named for Keinosuke Otaki, a former student of the senior author; now professor in the Imperial Military Academy at Tokyo.)

19. OTAKIA RASBORINA Jordan and Snyder.

Otakia rashorina JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 345, pl. IX, fig. 3; Lake Biwa.

Head 4; depth $4\frac{1}{5}$; D. 8; A. 7; scales 40 in a lateral series, 10 in a transverse series above ventral, and 17 between insertion of dorsal and occiput; eye 4 in head; snout $3\frac{1}{2}$; interorbital space $3\frac{1}{2}$; height of D. $5\frac{1}{5}$ in body; anal $7\frac{1}{2}$; caudal $3\frac{2}{5}$; pectoral 6; ventral $6\frac{2}{3}$.

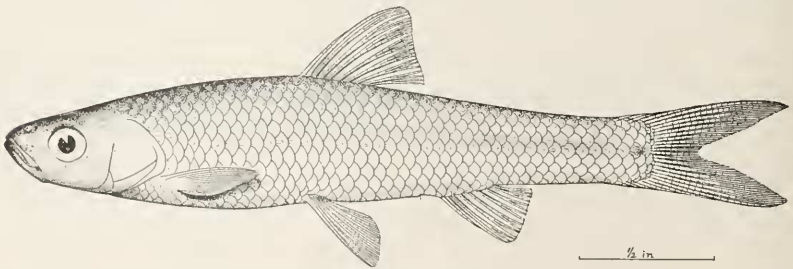


FIG. 6.—OTAKIA RASBORINA.

Body elongate, its depth about twice that of caudal peduncle. Head elongate; eye large, nearer tip of snout than posterior edge of opercle, a distance equal to half its diameter; mouth very oblique, the lower jaw included, the maxillary protractile, and not extending posteriorly to the edge of the orbit; no barbels, teeth slender, hooked and with a scarcely discernible grinding surface in two rows. Gill-rakers on first arch slender, long, pointed, and about 16 in number; pseudobranchiæ present. Air-bladder large, with a median constriction. Alimentary canal short. Peritoneum silvery.

Scales large.

Dorsal inserted a little anterior to the ventrals, the anterior rays weak; 8 developed rays, the first the longest and preceded by a shorter, slender, closely-adnate, simple ray, the other rays gradually shorter, and the edge of the fin concave, giving a somewhat falcate appearance when depressed; anal similar in shape to dorsal, the first developed ray preceded by a weaker, simpler, adnate ray, the second ray the longest and the others shorter; caudal deeply notched, the tips pointed; pectorals obtusely pointed; ventrals not reaching vent. Depth of caudal peduncle about 2 in depth of body. Lateral line extending along middle of body and caudal peduncle and straight, with the exception of a slight upper curve of the anterior 4 or 5 scales.

Color light; a silver lateral band, and a faint dark spot at base of caudal; a narrow, dark, medium dorsal band extending from head to base of caudal; upper parts with minute dots, especially upon the edges of the scales; dorsal fin a little dusky, the others without color.

Our specimen, probably young, 73 mm. (about 2 $\frac{3}{4}$ inches) long. Karasaki, Lake Biwa (Coll. K. Otaki) No. 49401 U.S.N.M.

The above description is from Jordan and Snyder. No specimens were taken by Jordan and Snyder in 1900.

(Name, a diminutive of *Rasbora*, a related genus. *Rasbora* is the Hindu name of *Rasbora rasbora*.)

14. TRIBOLODON Sauvage.

Tribolodon SAUVAGE, Bull. Soc. Philom. Paris, 1883, p. 16 (*punctatus*).

Barbels none; mouth small; suborbitals not dilated; pharyngeal teeth 5—2, recurved and hooked. Pseudobranchiae present. Peritoneum sprinkled with black points. Scales small. Dorsal with at least 9 divided rays, short and opposite the ventrals; anal short. Scales small; lateral line decurved and low, but terminating at middle of caudal.

Of the group *Danionina*. (Sauvage.)

(τριβόλα, harrow; ὀδοῦς, tooth.)

20 TRIBOLODON PUNCTATUS Sauvage.

Tribolodon punctatum SAUVAGE, Bull. Soc. Philom. Paris, 1883, p. 6; Lake Biwa.

Head 5 $\frac{1}{2}$ in total; depth 6 $\frac{1}{2}$ in total; D. 9; A. 10; scales 75 in the lateral line. Body elongate; snout much longer than the eye, whose diameter is 3 $\frac{1}{2}$ in head; interorbital space very much larger than eye. Dorsal midway between tip of snout and origin of caudal and a little in advance of the ventrals; caudal emarginate. Top of head black; small black points upon the scales; a bluish band along the back; extremity of dorsal black; ventrals yellow. Length 95 mm. (about 3 $\frac{3}{4}$ inches). Lake Biwa (Sauvage).

This species was not taken by Jordan and Snyder.

(*punctatus*, spotted.)

15. LEUCISCUS Cuvier.

- Leuciscus* (Klein) CUVIER, Règne Animal, 1st ed. 1817, p. 194 (*dobula*, *rutilus*, *leuciscus*, *alburnus*, and *phorinus*), *leuciscus*, the natural type.
- Dobula* RAFINESQUE, Ich. Oh., 1820, p. 45. (No type mentioned; *dobula* understood.)
- Leuciscus* RAFINESQUE, Ich. Oh., 1820, p. 45. (No type mentioned; *leuciscus* understood.)
- Leuciscus* AGASSIZ, Mém. Soc. Sci. Nat. Neuchâtel, 1835, p. 38 (*leuciscus*), (not *Leuciscus* Heckel, and of Günther, which is *Rutilus* of Rafinesque, the type being *rutilus*).
- Squalius* BONAPARTE, Fauna Italica, 1837, p. 6 (*tyberinus*).
- Leuciscus* BONAPARTE, Fauna Italica, 1837, p. 6 (*argenteus-leuciscus*).
- Telestes* BONAPARTE, Fauna Italica, 1837, p. 6 (*muticellus*).
- Cephalus* BONAPARTE, Catol. Metod., 1846, p. 39 (*cephalus*; no diagnosis).
- Microlepis* BONAPARTE, Catol. Metod., 1846, p. 39 (*turskyi*; no diagnosis).
- Richardsonius* GIRARD, Proc. Ac. Nat. Sci. Phila., 1856, p. 201 (*balteatus*).
- Tigoma* GIRARD, Proc. Ac. Nat. Sci. Phila., 1856, p. 205 (*pulchella*).
- Chwonda* GIRARD, Proc. Ac. Sci. Phila., 1856, p. 207 (*cooperi*).
- Sibona* GIRARD, Proc. Ac. Sci. Phila., 1856, p. 208 (*crassicauda*).
- Clinostomus* GIRARD, Proc. Ac. Sci. Phila., 1856, p. 211 (*elongatus*).
- Protoporus* COPE, Hayden's Geol. Surv. Montana for 1871, 1872, p. 473 (*dominus*).

Body oblong, compressed or robust. Head moderate; mouth usually large and terminal; lips normal; no barbels; teeth 5, 2—2, 4, usually 5, 2—2, 5 in the European types, hooked and with rather narrow grinding surface or none. Intestine short. Scales moderate or small. Dorsal posterior, usually behind ventrals; anal basis short or more or less elongate; caudal emarginate. Lateral line decurved, complete or variously imperfect. Size generally large, some species very small. A very large group, one of the largest current genera in ichthyology, represented by numerous species in the rivers of Europe, Asia, and North America.

The Japanese species belong to the typical subgenus, *Leuciscus*.
(λευκό5, white.)

- a* Caudal peduncle not very stout, its least depth not two-thirds the head; scales not closely imbricated; dorsal usually inserted behind ventrals.
- b* Scales large, 35 to 45.
- c* Scales about 38 *japonicus*, 21.
- cc* Scales 45 *citrulens*, 22.
- bb* Scales small, 60 to 100.
- d* Scales 60 to 66.
- e* Snout $3\frac{1}{2}$ in head. Sides nearly plain silvery *phalacrocorax*, 23.
- dd* Scales 70 to 78 *hakuensis*, 24.
- ddd* Scales 80 to 95 *taczanowskii*, 25.
- aa* Caudal peduncle very deep and compressed, its least depth nearly equal to the depth of head. Dorsal inserted behind ventrals, much nearer base of caudal than tip of snout; scales loosely imbricated, 63 to 72; sides of body mottled with darker scales.
- f* Snout $3\frac{3}{8}$ in head; teeth 2, 5—4, 2 *jouyi*, 26.

21. LEUCISCUS JAPONICUS (Sauvage).

Squalius japonicus SAUVAGE, Bull. Soc. Philom., Paris, 1883, p. 4; Lake Biwa.

Head $4\frac{3}{8}$ in total; depth $5\frac{1}{2}$ in total, D. 9; A. 8; V. 8; scales 38 in the lateral line; pharyngeal teeth 5—3. Snout slightly more than eye, which is $3\frac{1}{2}$ in head; no pores on snout; suborbitals narrow; interorbital space flat, more than eye. Dorsal inserted nearer tip of snout than caudal peduncle, and somewhat behind ventrals; caudal emarginate. Lateral line straight. Color silvery; black points upon back and upon each scale of lateral line. Length 85 mm. (about $3\frac{5}{16}$ inches). Lake Biwa. (Sauvage.)

This species has been observed only in the collection sent from Lake Biwa to Dr. Sauvage by Dr. Steenacker. It was not seen by Jordan and Snyder.

22. LEUCISCUS CÆRULESCENS (Sauvage).

Squalius cærulescens SAUVAGE, Bull. Soc. Philom., Paris, 1883, p. 3; Lake Biwa.

Head $5\frac{1}{4}$ in total; depth $5\frac{1}{4}$ in total; D. 9; A. 8; scales 45 in the lateral line; pharyngeal teeth 5—2. Snout somewhat shorter than the eye, which is 4 in head; a few pores upon the snout; suborbitals narrow; interorbital space convex, and somewhat more than the diameter of the eye. Dorsal inserted somewhat nearer the extremity of snout than base of caudal, and somewhat behind the ventrals; caudal emarginate. Lateral line straight. Color silvery, clouded upon the back, and upon the top of the head; a bluish band along the lateral line. Length 120 mm. (about $4\frac{1}{16}$ inches). Lake Biwa. (Sauvage.)

This species is known only from the description of Dr. Sauvage. (*cærulescens*, bluish).

23. LEUCISCUS PHALACROCORAX Jordan and Fowler, new species.

Head $3\frac{5}{8}$; depth $4\frac{3}{4}$; D. III, 7; A. III, 8; P. 17; V. 9; scales about 62 in the lateral line; 12 scales between origin of dorsal and lateral line, and 12 between latter and middle of belly; pharyngeal teeth 2, 5—4, 3; width of head 2 in its length; snout $3\frac{1}{2}$ in head; eye $4\frac{1}{2}$; interorbital space 3; pectoral about $1\frac{1}{3}$; ventral $1\frac{2}{3}$.

Body elongate and compressed. Head elongate, pointed, compressed, the sides somewhat flattened, and the upper profile slightly convex; snout rather long; pointed and slightly convex and produced; eye small, anterior, and $1\frac{1}{3}$ in snout; mouth nearly horizontal, only slightly inclined, the maxillary protractile, and reaching posteriorly to the anterior margin of the eye; lips fleshy, not dilated; pharyngeal teeth with narrow grinding surface, scarcely hooked; nostrils close together on the snout above and nearer the eye than tip of snout; interorbital space and top of head convex. Gill-openings large; gill-rakers short, and firm; pseudobranchiæ present. Intestine short. Peritoneum black.

Scales, cycloid, rather large, more or less even, and not imbricated; no pectoral flap; a small ventral flap.

Origin of dorsal midway between tip of snout and base of caudal; the first developed ray the highest, reaching beyond the others to the origin of the anal when depressed, the base of fin $1\frac{2}{3}$ in its height, and its upper edge nearly straight; origin of anal a little nearer tip of pectoral than base of caudal, the first developed ray the highest, reaching beyond the others when the fin is depressed, and its base $1\frac{1}{2}$ in its height, and its margin nearly straight; caudal deeply emarginate; pectoral reaching a trifle over two-thirds the distance to origin of ventral; ventral seven-ninths the distance to origin of anal. Caudal peduncle rather long, compressed, and its least depth $2\frac{1}{2}$ in head. Lateral line slightly decurved, and continuous.

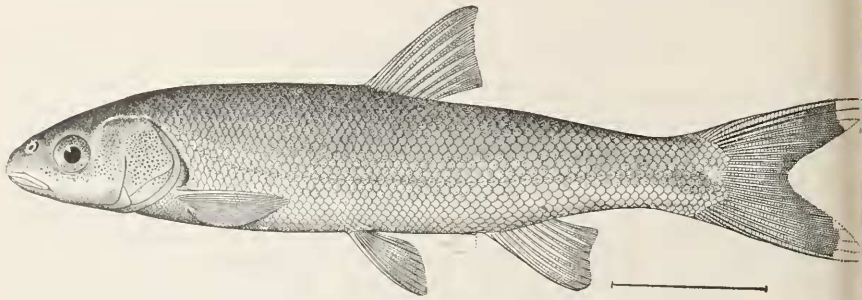


FIG. 7.—LEUCISCUS PHALACROCORAX.

Color in alcohol dark slaty brown, whitish or silvery beneath; dorsal and caudal brownish, pectorals also tinted with brown, all the other fins pale; a dark blotch along gill-opening above base of pectoral.

Length, $5\frac{3}{8}$ inches.

Type No. 7723, Ichthyological Collections, Leland Stanford Junior University Museum. Locality Tana River at Tachikawa.

Cotypes 50784, United States National Museum.

Of this species we have a number of specimens from the Tana River at Tachikawa, Koshyu (Imperial Museum), and the Kinu River in Utsumomiya. The specimens from the Tana River were obtained by us, through the efforts of trained cormorants, procured by Dr. Mitsukuri, Dr. Watase, and Dr. Iijima.

(*phalacrocorax*, "bald raven," the cormorant.)

24. LEUCISCUS HAKUENSIS Günther.

UGUI; AKAHARA (RED BELLY).

Leuciscus hakuensis GÜNTHER, Shore Fishes Challenger, 1880, p. 72, pl. xxxi, fig. B; Lake Hakone (misprinted "Hakow").—STEINDACHNER, Ichth. Beitr.

1881, p. 15; Japan.—JORDAN and SNYDER, Check List, 1901, p. 48; Yokohama.

Squalius hakuensis SAUVAGE, Bull. Soc. Philom., 1883, p. 4; Lake Biwa.

Leuciscus hakonensis ISHIKAWA, Zool. Mag., Tokyo, 1895, p. 129; Otsu on Lake Biwa.

Head $4\frac{1}{3}$; depth 4; D. III, 7; A. III, 7; P. 12; V. 8; scales 74 in lateral line; 14 scales between the origin of dorsal and lateral line, and 4 between the latter and middle of belly; pharyngeal teeth, 4, 2—2, 5; width of head about $1\frac{1}{4}$, or a little less than 2 in its length; snout $3\frac{1}{2}$ in head; eye $5\frac{1}{3}$; interorbital space 3; pectoral $1\frac{1}{2}$; ventral $1\frac{1}{2}$.

Body elongate and compressed. Head elongate, pointed, and compressed, the sides flattened, and the upper profile almost straight to tip of snout; snout rather pointed, somewhat broad and very slightly produced; eye small, anterior, $1\frac{1}{2}$ in snout; mouth moderate, the maxillary protractile, reaching posteriorly almost to the anterior margin of the eye, and not very oblique; lips fleshy, not dilated; pharyngeal teeth with grinding surface, not hooked; nostrils close together on the sides of the snout, and about half an eye diameter distant from the eye; interorbital space and the top of the head slightly convex. Gill-openings rather large; gill-rakers rather short and pointed, 4+9; pseudo-branchiæ present. Intestine short. Peritoneum pale gray.

Scales cycloid, moderately small and of rather even size; no pectoral flap; ventral with a small fleshy flap.

Origin of dorsal midway between tip of snout and base of caudal, pointed, the first developed ray the highest, reaching beyond the others to origin of anal, when depressed, its base $1\frac{1}{3}$ in its height, and its upper edge nearly straight; anal inserted midway between tip of pectoral and base of caudal, the first developed ray the highest reaching beyond the others when the fin is depressed, the base of the fin is $1\frac{1}{2}$ in its height and its margin straight; caudal deeply emarginate, the lobes pointed.

Pectoral two-thirds the distance to ventrals; ventrals inserted a little nearer the origin of the anal than that of the pectoral, and a trifle over three-fifths the distance to the former. Caudal peduncle rather long, its least depth $2\frac{1}{4}$ in the head. Lateral line slightly de-curved and continuous.

Color in alcohol dark brown, slightly olivaceous above and pale below; inside of gill-openings above dark; ventrals and anal pale or whitish; dorsal and caudal brown, the edges of the fin darker; pectoral grayish-brown.

Length, $13\frac{1}{4}$ inches.

This description from an adult female from Lake Jusan in Omori.

This is the most abundant species of *Cyprinidæ* in Japan, reaching a large size and often entering the sea. It ranges far to the northward, farther than any other of the *Cyprinidæ* except *Leuciscus tuzanowskii*. Our many specimens are from Lake Jusan in Omori (collection Sotaro Saito), Kawajiri in Rikuchu (collection Mitonobu Irako), Kitakami R., Katase River near Enoshima, Matsushima Bay in Rikuzen, Same in Rikuoku (in salt water), Aomori in Rikuoku, Kitakami River in Morioka, Sendai, Niigata in Echigo, Iwai River in Iehinoseki, Tsuruga in Echizen, Kinu River at Utsonomiya, Hakodate,

Oturu, Lake Biwa at Karasaki, Noyshiro (collection K. Otaki), Hiroshima, a lake near Oide (collection Jouy), and Yokohama (collection Jouy). The species freely enters salt water.

(Name from Lake Hakone on the mountain between Izu and Sagami.)

25. *LEUCISCUS TACZANOWSKII* Steindachner.

KUKI.

Leuciscus taczanowskii STEINDACHNER, Ichth. Beitr., X, 1881, p. 16; Sea of Japan. (Pectoral $1\frac{1}{2}$ in head, misprinted " $3\frac{1}{2}$.")

Head 4; depth $4\frac{2}{3}$; D. III, 7; A. III, 8; P. 17; V. 10; scales 93 in the lateral line (17 scales between the origin of dorsal and lateral line) and 14 between the latter and middle of belly; pharyngeal teeth 5, 2—2, 4; width of head $2\frac{1}{3}$ in its length; snout $3\frac{1}{3}$ in head; eye $5\frac{2}{3}$ in head; interorbital space a little over 3; pectoral $1\frac{1}{2}$; ventral 2.

Body elongate and compressed. Head elongate, pointed, compressed, and the sides flattened; upper profile of head almost straight to tip of snout; snout long, rather blunt and scarcely projecting beyond the mandible; eye small, anterior, $1\frac{3}{4}$ in snout; mouth moderate, the maxillary protractile, not reaching posteriorly as far as the eye, and not very oblique; lips fleshy, not dilated; pharyngeal teeth with grinding surface, slightly hooked; nostrils close together on the upper sides of the snout, and much nearer the anterior edge of eye than tip of the latter; interorbital space and top of the head rather broad and slightly convex. Gill-openings large; gill-rakers short, 4 + 10; pseudobranchia present. Intestine with a single convolution; peritoneum silvery.

Scales very small, cycloid, and of more or less even size; no pectoral flap; a small ventral flap.

Origin of dorsal nearer base of caudal than tip of snout, the first developed ray the highest reaching beyond the others to the origin of the anal when depressed, the base of the fin $1\frac{2}{3}$ in its height and its margin nearly straight; anal inserted midway between tip of pectoral and base of caudal, the first developed ray the highest reaching beyond the others when depressed, the base of the fin $1\frac{1}{4}$ in its height, and its margin nearly straight; caudal deeply emarginate, the lobes pointed. Pectoral reaches about two-thirds the distance to ventral; ventral inserted slightly before the origin of the dorsal, and reaches two-thirds the distance to anal. Caudal peduncle long, its least depth $2\frac{2}{3}$ in head. Lateral line slightly decurved, and continuous.

Color in alcohol dark brown, slightly olivaceous above, the lower surface of the body pale or whitish; dorsal, caudal, and pectorals grayish or brownish black, the other fins pale.

Length, $10\frac{3}{8}$ inches.

Fresh waters of Japan. We have a number of examples of this species from Lake Jusan, in Aomori, Noyshiro (collection, K. Otaki), and Junsaburogata (Nishitsu River), in Aomori (collection, S. Saito).

Its distribution is probably mainly northern.

(Named for Professor Taczanowsky, its discoverer.)

26. LEUCISCUS JOUYI Jordan and Snyder.

Leuciscus jouyi JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901; Sasuna, island of Tsushima, Straits of Korea.

Head, 4; depth, $3\frac{2}{3}$; D. III, 7; A. III, 7; P., 16; V., 9; scales, 68 in the lateral line; about 18 scales between origin of dorsal and lateral line, and about 16 between the latter and middle of belly; pharyngeal teeth, 2, 5—4, 2; width of head, about $1\frac{1}{4}$ in its length; snout, $3\frac{2}{3}$ in head; eye, a little over 4; interorbital space, $2\frac{1}{2}$; pectoral, nearly $1\frac{1}{2}$; ventral, $1\frac{2}{3}$.

Body elongate, rather deep, and compressed. Head small, pointed, depressed, and its width equal to its depth; snout pointed, rounded, and slightly produced; eye moderate, anterior, about $1\frac{1}{4}$ in snout; mouth slightly oblique, the maxillary protractile, and reaching posteriorly to anterior edge of eye; lips somewhat fleshy, not dilated; several pharyngeal teeth of the outer row with narrow grinding surface, and others slightly curved; nostrils close together on sides of snout, nearer front of eye than tip of snout; interorbital space and top of head broad and slightly convex. Gill-openings large; gill-rakers short and pointed, 2+6; pseudobranchiæ present. Intestine short. Peritoneum silvery.

Scales large, cycloid, and of rather even size; no pectoral or ventral flap.

Origin of dorsal much nearer the base of the caudal than tip of snout, and when depressed it reaches within a short distance of the base of the last anal ray; origin of anal about midway between tip of pectoral and base of caudal; caudal broad and deep, emarginate and the lobes rounded; pectoral about three-fifths to ventral; ventral inserted well before the dorsal, and much nearer the tip of pectoral than origin of anal. Caudal peduncle very deep and compressed, the least depth about equal to the depth of the head. Lateral line slightly decurved and continuous.

Color in alcohol brown, a little darker above and somewhat paler beneath, the sides mottled with scales darker than the others.

Length, $5\frac{1}{16}$ inches.

This description from one of the cotypes, No. 6376, Ichthyological Collections Leland Stanford Junior University Museum. Locality, Sasuna, island of Tsushima.

Of this species we have a number of specimens from Sasuna, island of Tsushima (cotypes), and we refer to it others from Kaminutani River near Lake Biwa, province of Omi.

Most of our examples have a dark median band running along the back from the occiput to dorsal and then continued behind the fin to caudal. Some are also more or less finely mottled with brown and have pores about the head.

(Named for its discoverer, Pierre Louis Jouy.)

16. PHOXINUS (Rafinesque) Agassiz.

Phoxinus RAFINESQUE, Ich. Ohiensis, 1820, p. 15 (no species mentioned; *phoxinus* understood).

Phoxinus AGASSIZ, Mém. Soc. Sci. Nat. Neuchâtel, 1835, p. 37 (*phoxinus*).

Hemitremia COPE, Proc. Amer. Phil. Soc., 1870, p. 462 (*vittata*).

Iotichthys JORDAN and EVERMANN, Fish. N. M. Amer., I, 1898, p. 243 (*phlegethontis*).

This genus contains small, brightly colored minnows of America, Europe, and Asia, differing from *Leuciscus* only in the incomplete lateral line. The scales are usually small, and the fins of the breeding males bright red in the spring.

(φοξός, tapering).

27. PHOXINUS STEINDACHNERI Sauvage.

ABURAMUTSU (FAT CHUB).

Phoxinus steindachneri SAUVAGE, Bull. Soc. Philom., Paris, 1883, p. 5; Lake Biwa.

Head $5\frac{1}{3}$ in total; depth $6\frac{2}{3}$ in total; D. 9; A. 9; scales 80 in the lateral line. Snout longer than eye, which is $4\frac{1}{3}$ in head; interorbital space greater than eye. Dorsal beginning at an equal distance from caudal peduncle and center of eye; caudal emarginate, yellowish, with numerous clouded black points; a blackish band from eye to caudal; dorsal and caudal dark; top of head and tip of snout black.

Length 170 mm. (about $6\frac{1}{8}$ inches). Lake Biwa. (Sauvage.)

This species is known solely from the account given by Dr. Sauvage. (Named for Dr. Franz Steindachner.)

17. ZACCO Jordan and Evermann.

Zacco JORDAN and EVERMANN, Fishes of Formosa, Proc. U. S. Nat. Mus., XXV, 1902, p. 322 (*platypus*).

Body moderately elongate and compressed; head compressed; snout conical, pointed; eyes moderate; mouth oblique, not notched; no barbels; teeth 5 or 4, 4, and 2 or 1—1, or 2, 4 and 4 or 5; interorbital space convex. Intestine short. Peritoneum black. Scales cycloid, narrowly imbricated, and 40 to 60 in the lateral line. Dorsal nearer tip of snout than base of caudal, or midway between, and its developed rays 7; anal inserted below, or a trifle before tip of depressed dorsal; its basis long, and composed of 9 or 10 developed rays; caudal emarginate; pectorals sometimes reaching ventrals; ventrals inserted a little before or below the origin of dorsal. Lateral line continuous and decurved. Breeding males have the head, the lower surface of the caudal peduncle, and the anal fin furnished with horny tubercles, not as numerous as those in *Opsariichthys*, and larger in proportion.

The anal fin also has the developed rays elongated and with adipose expansions.

(*Zako*, a Japanese name for river minnows, notably for *Acheilognathus lanceolata*.)

- a Scales about 43; teeth in inner row 2—2; sides with broad, dark cross bars. *platypus*, 28.
- aa Scales about 52, teeth in inner row mostly 1—1; a dark lateral band most distinct behind *temminckii*, 29.
- aaa Scales about 60; a dark longitudinal stripe most distinct posteriorly.
- b Maxillary not extending to opposite pupil, teeth 4, 4, 1—1, 4, 4..... *siboldi*, 30.

28. ZACCO PLATYPUS (Schlegel).

HAE (MINNOW); OIKAWA.

Leuciscus platypus SCHLEGEL, Fauna Japonica, Poiss., 1840, p. 207, pl. ci, fig. 1; streams of Nagasaki.

Opsariichthys platypus GÜNTHER, Cat. Fish, VII, 1868, p. 296; Japan and Formosa.—SAUVAGE, Bull. Soc. Phil., 1883, p. 8; Lake Biwa.—ISHIKAWA, Zool. Mag., 1895, p. 121; Hikone, Matsubara on Lake Biwa; Prel. Cat., 1897, p. 11; Tega Lake in Shimosa, Fukiage, Tokyo, Chi R. in Musashi, Chichibu, Suwa Lake, Ise, Kishin, Lake Biwa, Zensho, Kyoto, Tsuyama R.

Barilius platypus JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXII, 1900, p. 344, Lake Biwa; Coll. K. Otaki; Check List Fishes of Japan, III, 1901, p. 47; Lake Biwa.

Leuciscus macropus SCHLEGEL, Fauna Japonica, Poiss., p. 209, pl. ci, fig. 2; Nagasaki.

Leuciscus minor SCHLEGEL, Fauna Japonica, Poiss., p. 210, pl. ci, fig. 3; Nagasaki.

Head 4; depth $3\frac{1}{2}$; D. III, 7; A. III, 9; P. 13; V. 10; scales 43 in the lateral line; 8 scales between the origin of the dorsal and lateral line, and 5 scales between the latter and middle of belly; pharyngeal teeth 5, 4, 2—2, 4, 4; width of head $1\frac{2}{3}$ in length; snout a little over 3 in head; eye $4\frac{1}{2}$; interorbital space $2\frac{3}{4}$; pectoral 1; ventral $1\frac{1}{3}$.

Body elongate, compressed. Head moderate, compressed; snout slightly conical, pointed and not projecting; eye rather small, anterior and superior; mouth very oblique; the jaws rather thin and about equal; maxillary protractile, and not extending to the anterior margin of eye, but a trifle beyond the nostrils; no barbels; pharyngeal teeth without grinding surface, and slightly hooked; nostrils close together on the sides of the snout and nearer the eye than the tip of the former; interorbital space and top of head rather broad and convex. Gill-rakers short and pointed; pseudobranchiæ present. Intestine short and with few turns. Peritoneum black.

Scales rather large, and somewhat narrowly imbricated upon the sides; pectorals with a small, fleshy flap; ventrals with a small, scaly flap. Origin of the dorsal much nearer the tip of the snout than the base of caudal, when depressed reaching beyond the origin of anal, and the base of the fin a little more than half the head; anal inserted

a little nearer base of caudal than the origin of pectoral, and the base of the fin equal to three-fourths the length of the head; caudal deeply emarginate and the lobes sharply pointed; pectorals long, reaching the origin of the ventrals; ventrals inserted below the origin of the dorsal and reach to the origin of the anal. Caudal peduncle about as long as the ventrals, and its least depth about half their length. Lateral line strongly decurved and continuous to base of caudal.

Color in alcohol, dark bluish black above, the lower surface of the body silvery, and the sides with about 12 lead-blue cross-bands much broader than the spaces between; dorsal grayish with black streaks between each pair of rays and in the middle of the fin; caudal grayish, the other fins whitish with the anal tinged with grayish; sides of the head more or less grayish black. In life steel blue, the male with crimson fins.

Length, $5\frac{13}{16}$ inches.

This description from an adult breeding male taken at Tsuchiura, where we found it abundant and highly colored.

One of the most abundant of Japanese Cyprinidae. It is represented in our collections by very numerous specimens from Tsuchiura, the Kinu River at Utsonomiya, the Yodo River at Osaka, the Chikugo River at Kurume, the Yabe River at Funayado; abundant in the clear water and very brilliant, Nagoya in Owari, Tama River at Tachikawa (caught by tame cormorants), Kawatana near Nagasaki, and Lake Biwa at Matsubara.

Breeding males are provided with numerous large and hard, horny tubercles. They have the anal fin enormously developed, so that it extends beyond the base of the caudal, and it is also sometimes furnished with tubercles like those found upon the head. The colors of these males are also much brighter than others in which the coloration is more silvery. Young specimens are silvery and with distinct grayish or pale brownish lateral bands posteriorly.

(πλατύς, broad; πούς, foot.)

29. ZACCO TEMMINCKII (Schlegel).

KAWAMUTSU (RIVER CHUB).

Leuciscus temminckii SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 210, pl. CI, fig., 4; Nagasaki.

Opsariichthys temminckii GÜNTHER, Cat. Fish, VII, 1868, p. 295, from one of Schlegel's types.—SAUVAGE, Bull. Soc. Philom., 1883, p. 5; Lake Biwa.—ISHIKAWA, Zool. Mag., 1895, p. 121; Hikone, Matsubara, Otsu; Zool. Mag., VII, 1895, p. 121; Hikone, Matsubara on Lake Biwa.

Basiliscus temminckii JORDAN and SNYDER, Check-list Fishes Japan, 1901, p. 47; Lake Biwa.—ISHIKAWA, Prel. Cat., 1897, p. 11; Ise, Zensho, Kishin, Matsubara on Lake Biwa.

Head $3\frac{3}{4}$; depth $3\frac{3}{4}$; D. III, 7; A. III, 10; P. I, 15; V. 9; scales 52 in the lateral line; 11 scales between the origin of the dorsal and the

lateral line, and 6 scales between the latter and the middle of the belly, pharyngeal teeth 5, 4, 1—1, 4, 4; width of head 2 in its length; snout 4 in head; eyes 4; interorbital space 3; pectoral $1\frac{1}{4}$; ventral $1\frac{2}{3}$.

Body moderately elongate and compressed. Head moderate and compressed; snout slightly conical, pointed and not projecting; eye moderate, anterior and superior; mouth oblique, the jaws moderately thick and about equal; maxillary protractile and reaching beyond the anterior margin of the orbit; no barbels; pharyngeal teeth without grinding surface and slightly hooked; nostrils close together on the sides of the snout and nearer the eye than the tip of the former; interorbital space and top of head rather broad and convex. Gill-rakers short and pointed; pseudobranchiæ present. Intestine with few turns. Peritoneum black.

Scales moderate and somewhat narrowly imbricated along the sides; pectorals with a small, fleshy flap; ventrals with a pointed, scaly flap.

Origin of dorsal midway between tip of snout and base of caudal; when depressed reaching slightly beyond the origin of the anal, and the base of the fin $2\frac{1}{4}$ in head; origin of anal inserted a little nearer tip of pectoral than base of caudal and its base 2 in head; caudal deeply emarginate and the lobes pointed; pectorals long and terminating near the origin of the ventrals; ventrals reaching for three-quarters the distance to origin of anal. Caudal peduncle $1\frac{1}{2}$ in head and its least depth $2\frac{3}{8}$ in head. Lateral line strongly decurved and continuous to base of caudal along lower.

Color in alcohol dark brown above, pale or silvery below; sides with a distinct deep brown, lateral band, broader and darker posteriorly; dorsal and caudal grayish, the former with dark streaks between the fin rays, and the other fins more or less pale.

Length, $4\frac{1}{4}$ inches.

This description from a male taken at Kawatana. This locality, together with the Mogi River, near Nagasaki, are the only places where the species was obtained by Jordan and Snyder. We have numerous specimens from Mogi.

This species is close to *Zacco sieboldi*, and is distinguished chiefly by its larger scales and having the maxillary reaching to or slightly beyond the anterior margin of the eye. Breeding males have horny tubercles on the sides of the head and about the snout.

(Named for Prof. C. J. Temminck of Leyden, the associate of Schlegel.)

30. ZACCO SIEBOLDI (Schlegel).

Leuciscus sieboldii SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 211, pl. CI, fig. 5; Nagasaki.

Opsariichthys sieboldii GÜNTHER, Cat. Fish., VII, 1868, p. 295 (copied).—SAUVAGE, Bull. Soc. Philom., 1883, p. 5; Lake Biwa.

Head 4; depth $3\frac{2}{3}$; D. III, 7; A. III, 10; P. I, 11; V. 9; scales 61 in the lateral line; 13 scales between the origin of the dorsal and the lateral line, and 5 between the latter and the middle of the belly; pharyngeal teeth 4, 4, 1—1, 4, 4; width of head $1\frac{3}{4}$ in its length; snout $3\frac{1}{4}$ in head; eye $4\frac{2}{3}$; interorbital space $2\frac{1}{2}$; pectoral $1\frac{1}{3}$; ventral $1\frac{3}{5}$.

Body moderately elongate and compressed. Head pointed and compressed; snout somewhat conical, pointed, but not projecting; eye rather small, anterior and superior; mouth very oblique, the jaws moderately thin and about equal, the maxillary protractile and reaching posteriorly almost to the anterior margin of the eye; no barbels; pharyngeal teeth without grinding surface and slightly hooked; nostrils close together, on the sides of the snout, and nearer the eye than the tip of former; interorbital space broad and very slightly convex. Gill-rakers short and pointed; pseudobranchiæ present. Intestine short and with few turns. Peritoneum black.

Scales small, cycloid and somewhat imbricated upon the sides; pectorals with a short, fleshy flap; ventrals with a small, scaly flap.

Origin of dorsal midway between tip of snout and base of caudal, when depressed reaching beyond the origin of the anal, and its base 2 in head; anal inserted a little nearer the tip of the pectoral than the base of caudal, and the base of the fin $1\frac{1}{2}$ in head; caudal deeply emarginate, the lobes pointed; pectorals moderate, reaching about two-thirds the distance to origin of ventrals; ventrals inserted before origin of dorsal, broad and bluntly rounded, and reaching three-fourths the space to origin of anal.

Caudal peduncle about equal to ventrals, and its least depth about two-thirds their length. Lateral line strongly decurved, continuous, and running along the lower part of caudal peduncle.

Color in alcohol, dark brown above, pale or whitish below; a distinct median, longitudinal, dark, brownish-black band, becoming broad posteriorly, and continuing to the base of the caudal; dorsal grayish with a blackish streak between each pair of rays, forming a broad band across the fin, the upper edge whitish; caudal grayish, the edges dark; anal pale, with grayish black markings between the rays; pectorals and ventrals pale, tinged with grayish.

Length, $5\frac{1}{4}$ inches.

This description from an adult breeding male from Lake Biwa at Matsubara.

Of this species we have many specimens from Lake Biwa at Matsubara, the Chikugo River at Kurume, near Nagoya in Owari, Kibami

in Omi (collection in Imperial Museum), Fumayado in Kiusiu, and Karasaki on Lake Biwa (collection K. Otaki).

Breeding males, like those of *Zacco platypus*, have the sides of the head furnished with many large, horny tubercles, also the lower surface of the caudal peduncle and the anal fin. The rays of the anal are expanded and elongated. The color of the head is deep blackish-brown. Young specimens always have a blackish lateral band.

(Named for Philip Fredrik Siebold, of Leyden, who collected about Nagasaki and Omura, and under whose direction the Fauna Japonica was prepared.)

18. OPSARIICHTHYS Bleeker.

Opsariichthys BLEEKER, Atl. Ichthyol. Cyprin., 1860, p. 28 (*uncirostris*).

Body elongate, oblong, and compressed. Head rather pointed, greatly compressed, and the sides flattened; snout long; eye small, high; mouth large, very oblique, the maxillary reaching anterior margin of eye, and with a deep notch into which each ramus of the mandible fits; no barbels; teeth 5, 4, 2—2, 4, 5, on long, thin, pharyngeal bones; interorbital space broad and flat. Gill-rakers short, 3+9. Intestine short. Peritoneum silvery. Scales moderate, about 50, and more or less narrowly imbricated; a short pectoral flap. Origin of dorsal midway between tip of snout and base of caudal; anal basis long, with 9 developed rays, and its origin falling a little anterior to the tip of the depressed dorsal; caudal deeply emarginate; ventrals inserted below the origin of the dorsal. Lateral line continuous, and decurved. Breeding males have the head, lower surface of the caudal peduncle, and the anal fin furnished with numerous small horny tubercles. The anal fin has its rays elongate and more or less adipose.

Species of large size, inhabiting the Japanese lakes, especially delicate as food.

(ὀψαρίον, a little fish; ἰχθύς, fish.)

31. OPSARIICHTHYS UNCIROSTRIS (Schlegel.)

HASU.

Leuciscus uncirostris SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 211, pl. cu, fig. 2; near Nagasaki.

Opsariichthys uncirostris GÜNTHER, Cat. Fish., VII, 1868, p. 295 (copied).—SAUVAGE, Bull. Soc. Philom. 1883, p. 5; Lake Biwa—ISHIKAWA, Zool. Mag., VII, (Tokyo) 1895, p. 121, figs. 1, 2, 3; Lake Biwa in Omi—ISHIKAWA, Prel. Cat. 1897, p. 12; Nagahama and Matsubara on Lake Biwa—JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 344; Lake Biwa; Coll. K. Otaki—JORDAN and SNYDER, Annot. Zool. Japan, III, (Tokyo) 1901, p. 47; Lake Biwa.

Head $3\frac{3}{5}$; depth $3\frac{3}{4}$; D. III, 7; A. III, 9; P. I, 16; V. 9; scales 50 in the lateral line; 10 scales between the origin of the dorsal and the lateral line, and 5 between the latter and the middle of belly;

pharyngeal teeth 5, 4, 2—2, 4, 5; width of head $2\frac{1}{6}$ in its length; snout $3\frac{1}{2}$ in head; eye 7; interorbital space $3\frac{1}{4}$; pectoral $1\frac{1}{4}$, ventral $1\frac{3}{4}$; eye 2 in snout.

Body elongate, oblong, and compressed. Head rather pointed, greatly compressed, the sides flattened, and the upper profile almost straight; sides of snout rounded, and the tip blunt and truncated; eye small, anterior and superior; mouth large, very oblique, maxillary reaching the anterior margin of the eye, protractile, ensheathed above, and with a deep notch along the sides, into which the rami of the mandible fit; lower jaw projecting, and the symphysis fitted into a notch in the upper jaw: pharyngeal teeth on thin and long bones, more or less conical, several in the larger row with narrow grinding surface, and all rather small; nostrils close together on the sides of the snout, and about a half an eye diameter distant from the upper front of the eye; interorbital space and top of the head broad and flattened, the former very slightly elevated. Gill-openings moderately large. Gill-rakers 3+9, short and firm; pseudobranchiae present. Intestine with few turns, short. Peritoneum pale or silvery.

Scales large, cycloid, and more or less narrowly imbricated; a short, fleshy pectoral flap; ventrals with a scaly flap at base.

Origin of dorsal midway between tip of snout and base of caudal, when depressed, reaching beyond the origin of the anal, the base of the fin $2\frac{1}{3}$ in head, and its upper edge straight; origin of anal a little nearer the base of caudal than middle of pectoral, and the base of the fin $1\frac{2}{3}$ in head; caudal deeply emarginate, and the lobes pointed; pectorals long, reaching four-fifths the distance to origin of ventrals; origin of ventral below that of dorsal and reaching to within a short distance of the origin of the anal. Caudal peduncle $1\frac{2}{3}$ in head, and its least depth 3 in head. Lateral line continuous, inferior, and running along the lower part of the caudal peduncle.

Color in alcohol, dark brown above, the lower portions of the body pale; dorsal with the membranes between the rays and the tips of the posterior rays, grayish black, the rest of the fin paler; anal and caudal more or less grayish; pectorals and ventrals pale. Male with rosy shades in life.

Length, $12\frac{1}{2}$ inches.

This description from an adult male from Lake Biwa.

Of this species we have numerous specimens from Lake Biwa, at the little fishing hamlet of Matsubara, near Hikone, Lake Yogo, in Mino, the Yodo River at Osaka, and a few examples from the collection of K. Otaki, from Karasaki, on Lake Biwa.

This and numerous other species were collected also at Otsu, the chief town on Lake Biwa, by Prof. James F. Abbott.

Breeding males have the sides of the head, snout, mandible, lower surface of caudal peduncle, and anal fin provided with horny tubercles.

The anterior anal rays are elongate and extend to the base of the caudal.

The species, known locally as Hasu, reaches a larger size than any other Japanese minnow, except *Ishikauia steenackeri*. It is very delicate and finely flavored when boiled, and is much appreciated by Japanese epicures. It is also eaten raw.

(*uncus*, hook; *rostrum*, snout.)

19. ISCHIKAUIA Jordan and Snyder.

Ishikauia Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 346 (*steenackeri*).

Body elongate, compressed and deep. Head small, compressed, the upper profile nearly straight; snout and eye about equal, the latter about in the middle of the depth of the head; mouth very oblique, the maxillary protractile and reaching nostril; no barbel; teeth 5, 4, 2—2, 4, 5; interorbital space convex. Gill-rakers short and weak, about 4+9. Intestine short. Peritoneum silvery. Scales small, cycloid, about 70. Origin of dorsal midway between tip of snout and base of caudal; first developed ray of dorsal stiffened, spine-like; anal inserted behind tip of depressed dorsal, its base long, of 15 developed rays; caudal deeply emarginate, the lobes pointed; ventral inserted below origin of dorsal. Lateral line greatly deurved and concurrent with the lower profile of the body to the caudal.

Size large, color dusky.

This genus seems to be allied to the Chinese genus *Xenocypris*, differing in the smaller numbers of the teeth. (Named for Chiyomatsu Ishikawa, director of the Imperial Museum at Tokyo, who first sent us the species from Lake Biwa.)

32. ISCHIKAUIA STEENACKERI (Sauvage).

WADAKA; WATAKO (COTTON-THING); UMANO.

Opsariichthys steenackeri SAUVAGE, Bull. Soc. Philom. Poiss., 1883, p. 3; Lake Biwa.

Ishikauia steenackeri JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 346, pl. x; Lake Biwa.

"Genus? species? Wadaka" ISHIKAWA, Zool. Mag., 1895, p. 129; Otsu, Hikone, Nagahama.

Head 5; depth $3\frac{5}{8}$; D. III, 7; A. III, 15; P. 17; V. 9; scales 70 in the lateral line; 12 scales between the origin of the dorsal and the lateral line, and 7 between the latter and the middle of the belly; pharyngeal teeth 5, 4, 2—2, 4, 5; width of head $1\frac{2}{3}$ in its length; snout 4 in head; eye 4; interorbital space $2\frac{2}{3}$; pectoral about $1\frac{1}{2}$; ventral $1\frac{1}{5}$.

Body elongate, compressed and deep. Head small, compressed, and the upper profile nearly straight; snout about equal to eye, bluntly pointed; eye large, anterior, and nearly in the middle of the depth of the head; mouth very oblique, the jaws nearly equal, the maxillary

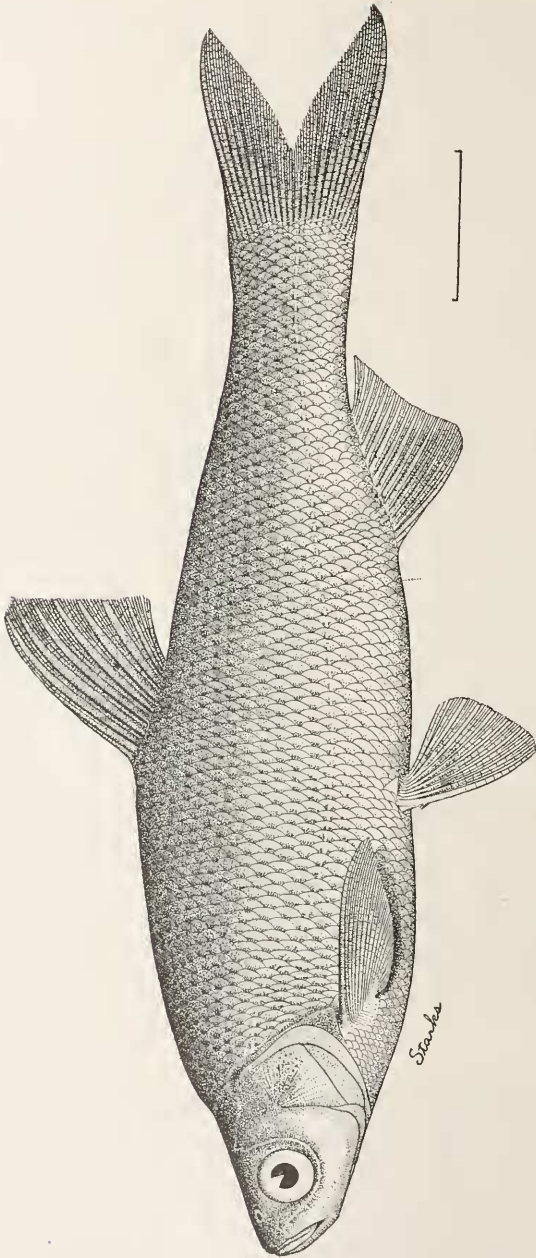


FIG. 8.—ISCHIKAULA STEENACKERI.

protractile and reaching below the nostril; lips fleshy; pharyngeal teeth compressed, and those in the outer rows with a narrow grinding surface; nostrils close together on the sides of the snout and near the eye; interorbital space broad and convex. Opercles striated. Gill-openings large; gill-rakers short, pointed, 4+9; pseudobranchiae present. Intestine rather short; peritoneum gray.

Scales large, cycloid and of even size; a small pectoral flap; ventral flap present.

Origin of dorsal midway between the tip of snout and base of caudal; when depressed reaching almost to origin of anal, the base of the fin $1\frac{1}{2}$ in its height, and its upper margin straight; anal inserted nearer origin of ventral than base of caudal; the base of the fin long, about equal to the length of the ventral, and its edge straight; caudal deeply emarginate, and the lower lobe the longer; pectoral a little more than two-thirds to origin of ventral; ventral three-fifths to anal. Caudal peduncle deep, compressed, and its least depth 2 in head. Lateral line decurved, and concurrent with the lower profile of the body to the caudal.

Color in alcohol, dark brown above, below silvery or whitish; dorsal and caudal brownish; pectorals tinted with brown, the other fins pale; posterior edge of each scale upon the sides and upper surface with a dark spot.

Length, 12 inches.

Described from No. 6247 Ichthyological Collections, Leland Stanford Junior University Museum (collection K. Otaki).

Of this species we have many specimens from the collection of K. Otaki from Karasaki on Lake Biwa, Maebara on Lake Biwa, and the neighboring village of fisheries, called Matsubara; the Yodo River at Osaka, Noyshiro (collection K. Otaki), and Matsubara on Lake Biwa (collection C. Ishikawa).

This fish is known only from Lake Biwa and its outlet, Yodo River, being locally very abundant, and known commonly as Wadaka. It grows to a large size, and is sold in the markets of Maebara, Otsu, and Osaka, but it is little valued as food.

(Named for its discoverer, Francisque Steenacker.)

20. CARASSIUS Nilsson.

Carassius NILSSON, Prodrromus, Ichthy. Scand., 1832 (*carassius*).

Body oblong, compressed and elevated. Mouth terminal, without barbels. Teeth 4—4, molar, but compressed. Scales large. Lateral line continuous. Dorsal fins very long, with the third ray developed into a stout spine, which is serrated behind; anal short with a similar spine. Ventrals well forward. Large species of the fresh waters of Europe and Asia; often domesticated.

(*carassius*, a Latinization of the vernacular names Karass or Karausche, applied to the European Crucian carp, (*C. carassius*.)

33. CARASSIUS AURATUS (Linnæus).

FUNA, HIWARA, GENGOROBUNA (JOHNNY CARP).

Cyprinus auratus LINNÆUS, Syst. Nat., 10th ed., 1758, p. 323.*Carassius auratus* GÜNTHER, Cat. Fish., VII, p. 32, and of all recent authors.

D. II, 18; A. II, 7; Scales, 26; teeth 4—4. Body stout, covered with large scales. Dorsal and anal fins with the spines strong, coarsely serrated. Coloration olivaceous, usually orange, or variegated in domestication.

Length, 12 inches.

Common everywhere in the streams of Japan and China. Our very numerous specimens of the common goldfish are from Chikugo River at Kurume, Tsuchiura, Same, Matsushima, Lake Biwa at Matsubara; Yodo River in Osaka, Wakanoura, Aomori, Nagasaki, Owari near Nagoya, Lake Yogo at Mino, Aomori, Migata, Morioka, Sendai, Tokyo, Kawatana, Tsuruga, and Tokyo. In its native condition the species is plain dark olivaceous.

(*auratus*, gilded.)

21. CYPRINUS (Artemi) Linnæus.

Cyprinus (Artemi) LINNÆUS, Syst. Nat., 10th ed., 1758, p. 320 (*carpio*).

Body robust, compressed. Mouth moderate, anterior, with 4 long barbels. Snout blunt, rounded. Teeth molar, broad and truncate, 1, 1, 3—3, 1, 1. Scales large. Lateral line continuous. Dorsal fin very long, with a stout spine, serrated behind; anal fin short, also with a spine. Large fishes of the fresh waters of Asia; introduced into Europe and America as food-fishes.

(*κυπρίνοϛ*, the ancient name of the carp.)

34. CYPRINUS CARPIO Linnæus.

KOI.

Cyprinus carpio LINNÆUS, Syst. Nat., 10th ed., 1758, p. 320.—GÜNTHER, Cat., VII, p. 25, and of all authors.

Dorsal III, 20; A. III, 5; scales 5—38—5; teeth 1, 1, 3—3, 1, 1. Body stout, more or less compressed, heavy anteriorly. L. 18 inches or more. Fresh waters of central Asia; introduced as a food-fish into Europe and America. In domestication, it has run into many varieties, distinguished by differences in form, squamation, and development of fins.

The carp, or koi, is common throughout southern Japan, having doubtless been introduced from China, although much less common than the goldfish, or Funa.

(*carpio*, carp.)

SUMMARY.

Family CYPRINIDÆ.

1. *Pseudoperilampus* Bleeker.

1. *typus* Bleeker; Tsuruga, Tsuchiura, Matsushima, Tokyo.

2. *Paracheilognathus* Bleeker.

2. *rhombæ* (Schlegel); Matsubara and Karasaki on Lake Biwa, Yodo River, Chikugo River, Funayado, Lake Yogo.

3. *Acheilognathus* Bleeker.

3. *limbata* (Schlegel); Lake Yogo, Iwai River at Ichinoseki, Nagoya, Kitakami River at Morioka.

4. *lanceolata* (Schlegel); Tsuchiura, Chikugo River, Yodo River, Lake Biwa at Matsubara and Katata, Lake Yogo, Funayado, Wakanoura, Nagoya.

5. *cyano stigma* Jordan and Fowler; Lake Biwa at Matsubara, Lake Yogo.

4. *Gnathopogon* Bleeker.

6. *elongatus* (Schlegel); Lake Biwa.

7. *gracilis* (Schlegel).

5. *Hemibarbus* Bleeker.

8. *barbus* (Schlegel); Yodo River, Lake Jensaburogata in Aomori, Chikugo River, Tokyo, Formosa.

6. *Leucogobio* Günther.

9. *güntheri* Ishikawa; Matsubara, Lake Biwa, Nagoya, Katata, Kurume.

10. *jordani* Ishikawa.

11. *mayedæ* (Jordan and Snyder); Karasaki, Zeze, and Matsubara on Lake Biwa, Yodo River, Nagoya.

12. *buræ* (Jordan and Snyder); Matsubara on Lake Biwa.

7. *Pseudogobio* Bleeker.

13. *esocinus* (Schlegel); Karasaki and Matsubara on Lake Biwa, Kitakami River at Morioka, Matsushima, Kinu River, Tsuruga, Yodo River, Kawatana, Iwai River at Ichinoseki, Kaminutani River.

8. *Sarcocheilichthys* Bleeker.

14. *variegatus* (Schlegel); Matsubara on Lake Biwa, Yodo River, Chikugo River, Lake Yogo, Nagoya, Tsuchiura, Funayado, Tokyo.

9. *Abbottina* Jordan and Fowler.

15. *pseuma* Jordan and Fowler; Yodo River, Osaka, Chikugo River, Iwai River.

10. *Zezero* Jordan and Fowler.

16. *hilgendorfi* (Ishikawa); river at Funayado in Kiusiu, Kamo River in Yamashiro.

11. *Bivia* Jordan and Fowler.

17. *zezero* (Ishikawa); Yodo River at Osaka.

12. *Pseudorasbora* Bleeker.

18. *parra* (Schlegel); Tsuchiura, Nagoya, Lake Yogo, Lake Biwa at Matsubara and Karasaki, Iwai River, Chikugo River, Yodo River.

13. *Okakia* Jordan and Snyder.

19. *rashorina* Jordan and Snyder; Karasaki on Lake Biwa.

14. *Tribolodon* Sauvage.

20. *punctatus* Sauvage.

15. *Leuciscus* Cuvier.

21. *japonicus* (Sauvage).

22. *cervulescens* (Sauvage).

23. *phalacrocorax* Jordan and Fowler; Tana River at Tachikawa, Koshiyu, Kinu River at Utsonomiya.

24. *hakuensis* Günther; Lake Jusan, Kawajiri, Kitakami River near Morioka, Katase River near Enoshima, Matsushima, Same, Sendai, Nügata, Iwai River at Ichinoseki, Tsuruga, Kinu River at Utsonomiya, Hakodate, Otaru, Noyshiro, Hiroshima, Oide, Lake Biwa at Karasaki.

25. *taezonowskii* Steindachner; Lake Jusan in Aomori, Nishitsu River, Aomori, Noyshiro.

26. *jouyi* Jordan and Snyder; Sasuna, Tsushima, Kaminutani River.

16. *Phoxinus* (Rafinesque) Agassiz.

27. *steindachneri* Sauvage.

17. *Zacco* Jordan and Evermann.

28. *platypus* (Schlegel); Tsuchiura, Kinu River at Utsonomiya, Yodo River at Osaka, Chikugo River at Kurume, Yobe River at Funayado, Nagoya, Tana River at Tachikawa, Kawatana, Lake Biwa at Matsubara

29. *temmincki* (Schlegel); Kawatana, Mogi.

30. *siboldi* (Schlegel); Lake Biwa at Matsubara and Karasaki, Chikugo River at Kurume, Nagoya, Kitami, Funayado.

18. *Opsariichthys* Bleeker.

31. *uncirostris* (Schlegel); Lake Biwa at Matsubara and Karasaki, Lake Yogo, Yodo River.

19. *Ischikania* Jordan and Snyder.

32. *sternaekeri* (Sauvage); Lake Biwa at Maebara, Matsubara and Karasaki, Noyshiro, Yodo River at Osaka.

20. *Carassius* Nilsson.

33. *auratus* (Linnaeus); everywhere in central and southern Japan.

21. *Cyprinus* Linnaeus.

34. *carpio* (Linnaeus); throughout southern and central Japan, probably introduced.